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Home Satellite TV

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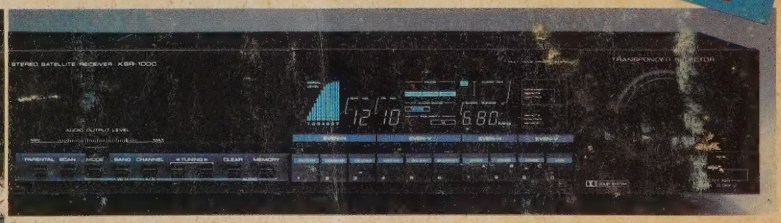

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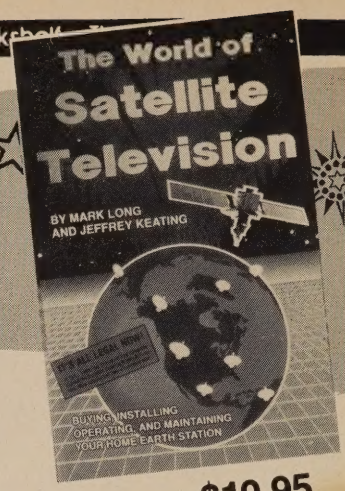

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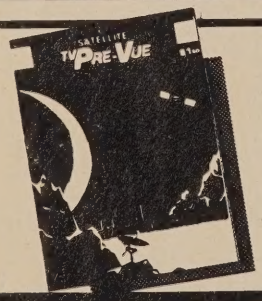

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Home Satellite TV

VOLUME 2, NUMBER 1 — The Magazine of Total Television — JAN., 1986

COVER - *The latest in TVRO equipment takes the spotlight. (Photos by Kenwood and Winegard.)*

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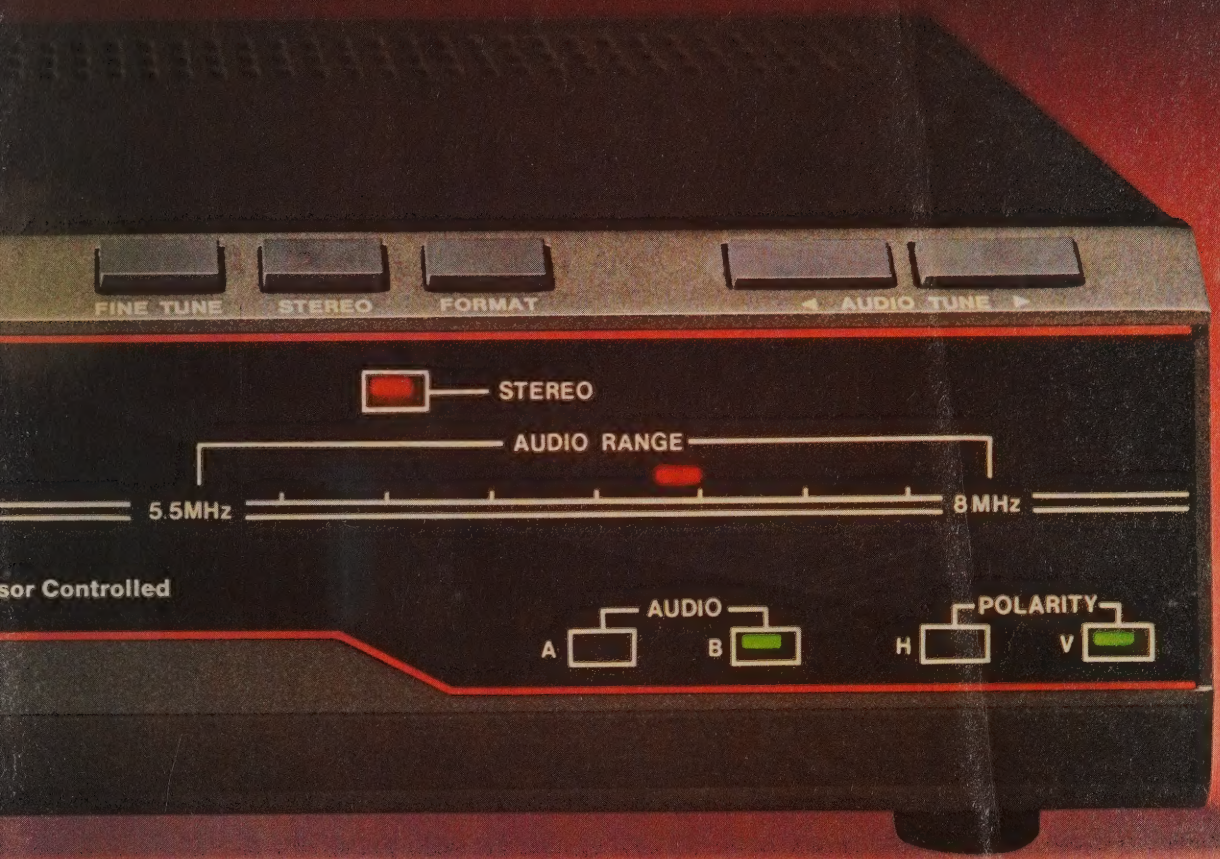
XR-1



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Home Satellite TV

WHEN TO BUY

On a recent plane ride to Los Angeles, I was chatting with a fellow who seemed determined to pick my brain with regard to home satellite systems. He not only wanted to know what state of the art was today, but where things were going tomorrow.

"Will there be two foot Ku bands dishes everywhere? What about scrambling—is it here to stay? Will we all have descramblers built into our receivers? Will surround sound stereo be available without extra cost? Tell me," he seemed to be asking, "what does the future hold?"

I know people are sometimes desperate for information in a field growing as rapidly as is this one. Consequently, when having such a chat, I always try to present the facts in as much detail and a clearly as I understand them. But this fellow's intensity struck me as curious. "Why is it so important to you?" I finally asked.

He seemed momentarily flustered, then explained that he was about to spend several thousand dollars on a system. He really wanted it, especially to get sports broadcasting, but he didn't want to spend the money if what he bought today would be obsolete tomorrow.

I understood and sympathized. I pointed out that I was in the same position five years ago when I bought my first computer. At that time I wondered should I wait until the field became standardized or should I buy immediately? I bought at once and never regretted it.

Home Satellite systems are similar, I pointed out. "True, as in any high tech field today, things move forward rapidly and eventually you may want to update. But until then, you can sit back in your living room and enjoy the marvels of total (130 channel) television."

I pointed out, however, there was another consideration. My parents had waited nearly a dozen years before they bought their first black and white TV in the late fifties. They said they wanted to be sure it was "perfected" If they had stuck to that reasoning, they would be waiting still!

In this field, things will never stop changing and there will never be a time when we can easily say, "Now, everything is perfected and I can buy the *final* system." My words of advice (for what they were worth) to the fellow were that he should jump on board as soon as he could and enjoy the technology for all it was worth! In Home Satellite TV, tomorrow is today.

- Bob Wolenik

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Kidnapping A Satellite

Some Fictional Space Pirating

Roll your clock backwards nine years with me, give or take a few months. It is the summer of 1976. Do you remember what you were doing? I remember very clearly what I was doing.

Four of us sat in a bar at a resort lodge run by the State of Oklahoma. Outside the temperature was above 100 degrees and we had just "come in" after spending upwards of 8 hours laboring to make some 15-foot satellite dishes "play". Our reward consisted of a cold beer. In an adjacent room, several hundred cable TV system owner/operators were standing in fixation staring at a test pattern from HBO/Home Box Office. In another 30 minutes the test pattern would be replaced on the screen by the start of the evening programming. There was only one HBO channel in those days. We'd know when the programming started because even through a solid wall we would hear the applause from the cable folks when "HBO signed on".

The four of us were a part of a very small cadre of folks who actually knew what "LNA" stood for, who knew where to point a dish to get a satellite signal, and who knew that HBO was found on transponder 17 of F2. One of the four asked "How is your dish coming?". He was referring to my at-home satellite dish, a project nearing completion. This particular fellow was "in charge" of LNAs for the industry. His firm made LNAs and in their best month to date, they had made and sold *45* LNAs. We counted the capacity of the LNA suppliers (two at the time) in tens-of-units per month in those days.

"We got some new GaAs-FETs in last week from Japan. I think they will be good enough that we may even get some 150-degree units out of 'the yield'," he said. The other duo in the quartet heard his remark and joined us in conversation. "Ought to be worth $5,000 each. If we get one, would you like it for your system?" he asked, fol-

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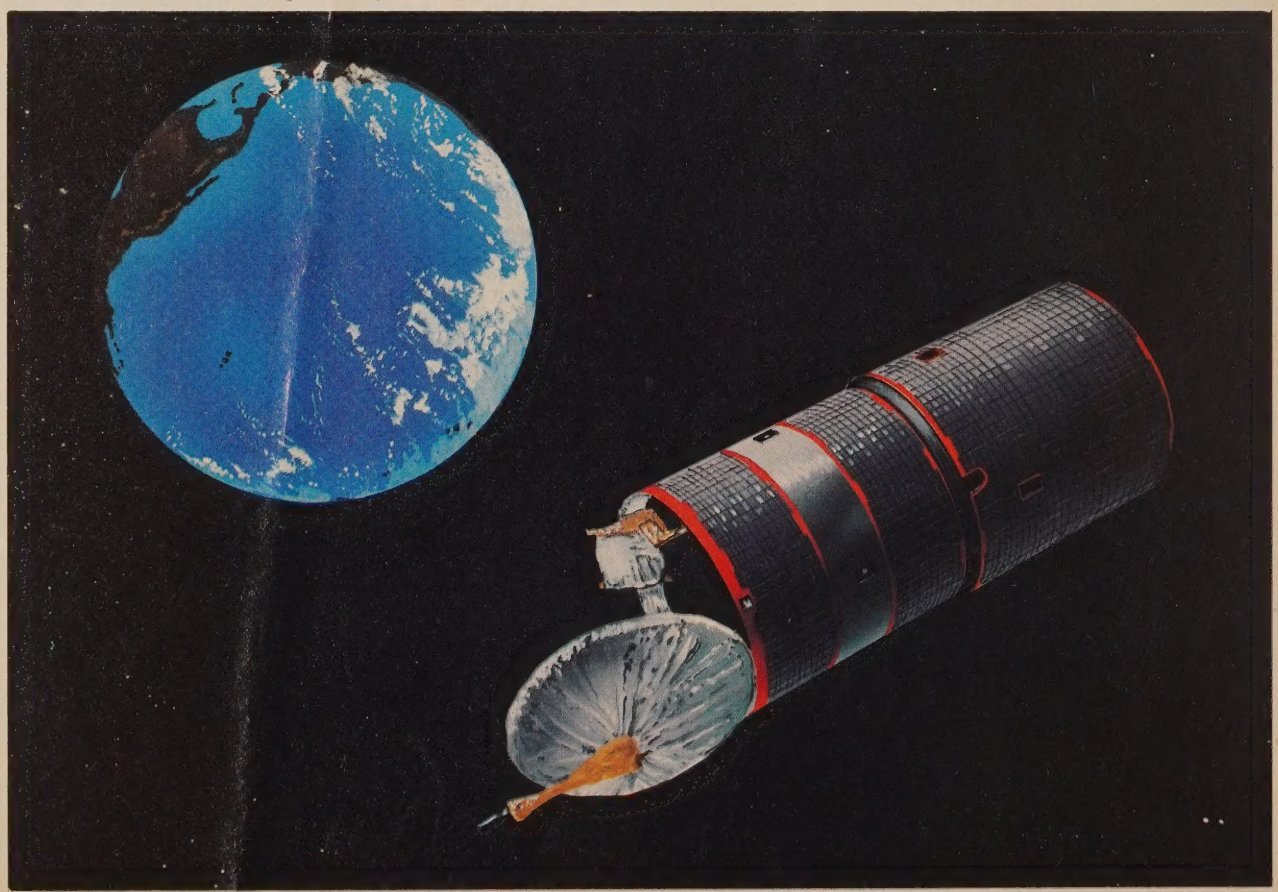
Vulnerable - *A satellite in space "might be easier to hijack than an airliner!"*



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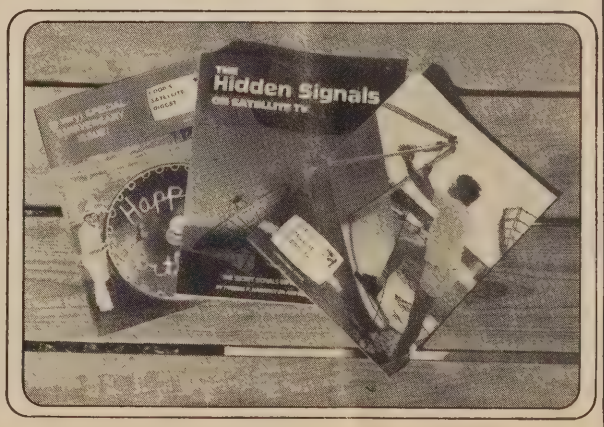

Continued from page 10

lowing 'system?' with a long swallow of beer.

He knew I didn't have $5,000. He knew I would nearly kill for a 150-degree LNA. He also knew that the only way I would ever get an LNA, of *any* temperature, was from him.

It may be difficult to accept that just nine years ago the entire LNA universe consisted of between 120 and 130 LNAs per month, *worldwide*. It may be equally difficult, when a 65-degree LNA today sells for under $100, to accept that nine years ago 180 and 220-degree LNAs sold for upwards of $3,000 each. All of this becomes more understandable when you learn that those tiny GaAs-FET transistors, the "magic" inside of LNAs that made them work at all, were hand-carried to the U.S. from Japan in a brief case locked to a courier's wrist with a chain.

It was during this cable show beer drinking session that I first recall talking about "stealing" a satellite.

"*When it cools off*, let me hook up the spectrum analyzer *so I can show you the uplink control signals,"* one of the fellows offered. "You can see the control data at the bird, and the reporting data used to report on the bird's internal operation, on the analyzer," he continued. He was explaining how a special piece of test equipment allowed someone on earth not associated with the satellite operating company to actually "watch" the ground controllers "fly" the satellite. Then, as now, there was a "pilot" sitting in a command center someplace monitoring the satellite's attitude 24 hours per day and sending commands back to the satellite when required to correct its position.

"*What would it take to decode the control signals?*" someone asked. "Could you actually display what they say and know everything about the satellite that RCA knows?" the next questions came. It would turn out that because a satellite "downlinks" everything its computer knows in a constant stream of data pulses, a person with the right equipment *could monitor* everything going on with the satellite. The next question was predictable.

"Then if you can monitor the bird from here, *why couldn't you also control it from here?*". "Here" was a wheat field in Oklahoma. "There", where RCA really did the controlling, was a valley in New Jersey just outside of New York City. The quartet pooled our various disciplines and came to a reasoned, even educated opinion.

"You know, it would be possible, if you knew or could figure out the control codes, to uplink a signal that was stronger than the RCA uplink signal controlling the bird, *and actually take over control of the bird!*"

Several years hence, visiting at the RCA control center in Vernon Valley, New Jersey while videotaping a special report on how an uplink works day to day, I would make the same remark to an RCA engineer in charge of the facility and watch his face turn an ashen white. After a suitable recovery period, he would admit to me that RCA had always been concerned that somebody might come along and "steal" their satellite from them. He would also explain, in very general terms, some of the safeguards RCA had put in place to prevent "unauthorized control of a satellite".

"Stealing a satellite" would be a major act of aggression. *The rewards could be significant*. Only an amateur would plot to steal the bird out of the RCA or Hughes *factory*. A bird on the ground is not worth much. A bird already in the Clarke Orbit Belt could be worth tens and tens of millions. Recently, a fully-loaded 1985 bird, equipped with the latest electronics, long-life solar panels and chrome styling went for nearly $300,000,000. A clever person could figure out how to get at least a third of that by simply "borrowing" a satellite's control signals long enough to move the bird a few hundred or a few thousand miles away from where it was supposed to be. I can visualize the ransome note now.

"We have your bird. It is safe and under control. Do not try to locate it on your own because if you do, we will eject it from Clarke Orbit and send it uselessly tumbling into deep space. Ransom demands will follow. Be at the telephone booth at 3rd and Main at 6 p.m. where you will receive further instuctions."

Say you have the technical ability to grab control of the Hughes Galaxy 1 satellite. You'd move it a few hundred miles away from where Hughes had it parked and shut it down, all by remote control. Turned off, but under *your control*, nobody could find it. A "silent bird" would be harder to find that the proverbial needle in a haystack.

"If you call in NASA to help you look for Galaxy 1" the second communique might read "your bird is a goner. We have the coded instructions to propel it another 10,000 miles higher above earth and if you do not follow our instructions exactly, you can kiss your bird bye-bye" reads the cryptic notice delivered from a speech synthesized modem to the telephone located at Third and Main street.

If Galaxy 1 suddenly moved from 134 west, because somebody had 'grabbed control' away from Hughes flight controllers, nearly 35,000,000 TV sets tuned to cable TV's best programming would develop a severe case of "snowitus". HBO, Showtime, The Movie Channel, WTBS, ESPN, and on and on would suddenly "go dark". If the kidnappers held onto the bird for *a month*, the loss to the cable industry would amount to more than five hundred million. That's a lot of bucks. The "ransom potential" is measured in hundreds of millions of dollars.

"In a plain brown Lear Jet, unmarked and flying at 500 feet, bring $200,000,000 in old, tattered, $20 bills" the ransom message would start *"to an airfield located at 21° 32'16 ' north, 78° 31" 46' west. The pilot and co-pilot will be returned within 48 hours and they will bring with them the coordinates of your missing bird."*

Stealing a satellite in 1976 was a fun "paper exercise" but I am glad we waited. At most, a stolen satellite might have been ransomed back to its owner for perhaps its original cost at that time. Today, 'the right satellite" would be worth far more than in 1976 because the value of a satellite is measured in its revenue producing capability, not its (relatively low) replacement value. Holding onto Galaxy 1 for just sixty days could cost the cable TV industry a billion dollars. I hope James Bond is listening *(1)*.

Stealing an American communica-

Continued on page 14

1. "Coop some years ago began writing a fictional novel based upon the premise of satellite theft but shelved the project because of the press of more timely writing deadlines. He now reports his interest in finishing the project has been rekindled by the events of recent months.

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Continued from page 12

tions satellite would be high tech stuff, but hardly impossible. In fact, it would be easier than hi-jacking a TWA flight out of Athens, and far less dangerous.

By 1979, our little group of four had moved onto bigger and better things; like stealing a *Russian Molniya* satellite. Actually, it would turn out to be a far less challenging exercise.

Russia's Molniya satellites broadcast television to Siberia and the far northern extremes of the USSR. They do this by not sitting over the equator like ordinary satellites; rather they "loop" through the sky and travel around the earth once every 23 hours and 56 minutes. Shortly after it heads south, the Russian controllers turn it off and for all practical purposes *they lose sight of and control of* the Molniya satellite for a couple of hours.

"See here, even though the Russians have turned the bird off, you can still see the beacon". My friend was pointing to a tiny mark on the test equipment screen. The "pip" on the spectrum analyzer told us both that we had the "silent bird" in our sights.

"As soon as they turn it off, the Russians switch to another Molniya satellite" he went on. For at least 90 minutes, *there is nobody watching the store*. This bird is just drifting through space waiting for somebody to knock on its door!"

We fashioned a ransom note to the Russians.

"Molniya #57 is safe and sound and under our control" it began. *"Do not try to find it or we will direct it to crash on Buenos Aires."* Then we crossed out Buenos Aires and scratched in "Miami". We figured the Russians would have a harder time explaining why one of their satellites "attacked" a city in the USA than it would with the government of Argentina.

"Does anyone here speak and write Russian???" one of my quartet asked loudly in the bar. Fortunately, nobody did and we grabbed at his belt to pull him back into his seat. We had reached the point of drafting an "authentic Russian ransom note" but asking for volunteers who spoke Russian in a public bar in Los Angeles was probably not the smartest thing we could do.

The Russian control system, for its "domestic satellites" flying around over Canada and the USA, is extremely unsophisticated. A semi-experienced amateur radio operator could configure his own commands in a day or two. He would be well advised not to stand up in a bar in Los Angeles however and ask if anyone there could translate those commands to the Russian alphabet.

I was reminded of this "early satellite history" recently when a reader wrote to suggest "If HBO and the other cable programmers keep up this insane plan to scramble their signals,

" . . . would it be possible to scramble the scrambling? The answer is, yes!"

wouldn't it be possible to "scramble the scrambling" by transmitting an interfering signal to the satellite from a backyard dish???" The answer of course is "Yes, that could be done." And in fact, last spring somebody did just that for more than 10 hours time on a Movie Channel feed.

A satellite sits out there defenseless. All it takes is a transmitter and an antenna to send signals to a satellite. And in most situations, the satellite will send back whatever signals it receives. *Automatically*. If somebody turned on a transmitter designed to interfere with the HBO uplink signal on Galaxy 1, not only would that interference wipe out HBO, it would destroy the HBO scrambling system as well.

"If they are going to scramble their signals and charge excessively for private homes to use them, what is to prevent somebody from simply *denying them use* of their signal for cable as well, by "interfering" with the scrambling signal?" The answer is that for less than $50,000, *maybe much less*, a person could drive HBO right off the air.

"I have a 300 watt uplink transmitter sitting here on my garage floor" said the telephone caller." I figure a 15-foot dish and this transmitter, and HBO is out of business." I asked this person how he located the transmitter. "Surplus market" came the reply. Yes, I remembered seeing some of those units for sale the previous month.

"Suppose Cuba wanted to retaliate for the new propaganda broadcasts originating in Florida?" the voice went on. "Don't the Cubans have their own satellite uplinks? What's to prevent them from simply pointing their uplink at an American satellite, such as Galaxy, and turning it on? Wouldn't that wipe out HBO or Showtime service?" Of course it would. The White House backed "Radio Marti" broadcasts, commisioned earlier this year in the Florida Keys and designed to "educate" the Cuban masses, has already drawn a threat from Cuba's Castro to "fight back by blocking U.S. airwaves". Hey, *he is already equipped to fight the ultimate battle!* He could block our satellite transmissions with no more than 30 minutes of preparation time. And that concerns me.

One of the responsibilities of a journalist is to avoid "inciting people" with emotions which override "law". Transmitting signals to a satellite without an appropriate license is "agin" the law.

Scrambling of satellite signals has become an exceedingly emotional issue. Emotions affect judgement in both love, and, war. I fully expect emotions to prevail here and it will not surprise me one bit when purposeful interference to HBO and other signals begins on a fairly regular basis. It will also not surprise me to ultimately learn that some or all of this "interference" is coming from non-US based transmitters.

I still like the concept of kidnapping a satellite and holding it for ransom. Perhaps that is the ultimate answer to the threat of scrambling; if "*they* scramble", then "*we* kidnap their satellite". I have the ransom note already written:

"Your satellite is being detained in a safe spot in the "galaxy" until you come to your senses concerning scrambling. You may communicate with us via F4, transponder 18, to tell us when you have come to a "rational" decision on this scrambling matter and are willing to guarantee no more scrambling talk or scrambling testing until 1990 at the earliest. Within 24 hours of your so advising us, Galaxy 1 will be returned to its proper Clarke Orbit location. The Committee to Save Space from Unnecessary Scrambling."

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THE RUSH TO Ku BAND

Its The Hottest New Development In Home Satellite Television

BY DAVID B. SHELDON

Ku-Band (sometimes pronounced Q-Band), 12 GHz, 12 gig, DBS, all are names given to the latest satellite broadcast band, 11.7 to 12.2 GHz (gigahertz or billion cycles per second). Whatever name you choose, this new technology has everyone in the home satellite business talking. At a recent satellite trade show in Nashville, TN, the introduction of a few products designed to receive 11.7 to 12.2 GHz broadcasts caused as much excitement as did the many products currently being sold throughout the world for receiving the more popular C-Band (3.7 to 4.2 GHz) broadcasts.

So why all the fuss about this new band? Still in its infancy, Ku-Band currently offers only eleven regularly scheduled video services and a handful of occasional services on 10 satellites.

Compared to the 120 plus video services and half again as many audio services available on C-Band, Ku-Band looks pretty modest. So what is the attraction of this new broadcast medium?

DBS IS HERE NOW!

Direct Broadcast Satellite (DBS) describes the concept of utilizing high-powered relay satellites to broadcast a variety of entertainment and information TV channels directly to homes equipped with *small* (2-4 ft.) dishes. Except for the dish size, this is basically what we have today with the current 3.7 to 4.2 GHz band, although more than a few program suppliers will argue that it was never their intention to have over a million homes receiving their C-Band broadcasts directly.

C-Band is the way that the cable channels and TV networks distribute their programs nationwide to thousands of cable companies and TV stations who then redistribute the programs to their viewers.

Originally the satellite broadcast industry felt that C-Band would be too limited for direct-to-home use. The typical 12 ft. dish was much too large for the postage stamp backyards of suburbia.

There are also interference problems from the ever-growing number of telephone companies that crowd the 3.7 to 4.2 GHz band with point-to-point microwave links. In some areas, C-Band satellite reception is difficult to impossible depending on the amount of interference caused by these terrestrial sources.

In a way C-Band satellite is just a brief pause on the way to bigger and better things in the technological climb of the broadast world. However, low cost 6 to 12 ft. satellite systems, capable of receiving hundreds of channels from 20 C-Band satellites have sort of delayed this evolution to the benefit of over a million home satellite TV viewers. Call it C-Band Direct if you will. DBS is here now!

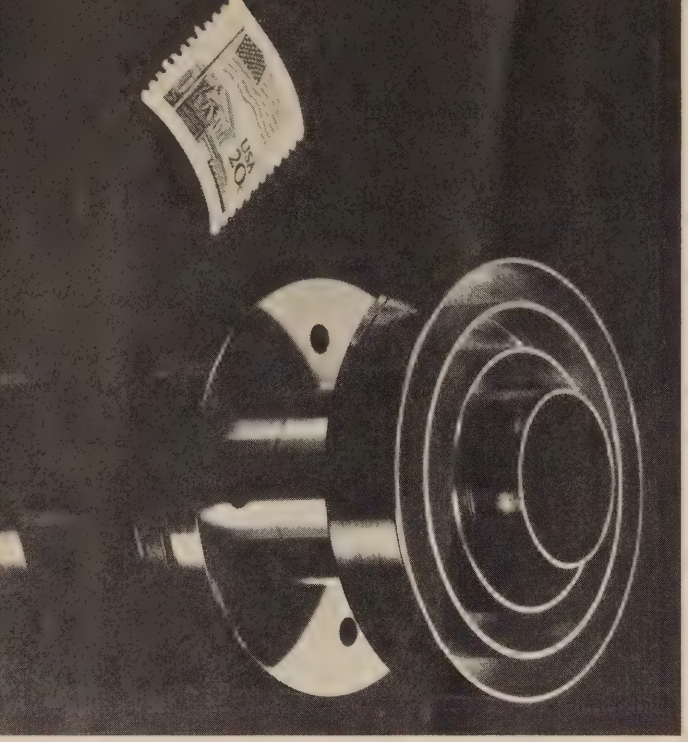
PICKING UP KU-BAND

Today you can receive Ku-Band satellite broadcasts with equipment that is currently available from a variety of manufacturers. However, it's not quite as easy as receiving C-Band for a variety of reasons:

1. There are no standards at this time for Ku-Band broadcast frequencies. 12 GHz satellites may use 27-, 43-, 54-, or 72- MHz bandwidths for each transponder. Transponder spacing formats are also varied, meaning that the center frequencies of many of the Ku-Band services will not be on the same center frequencies as the C-Band services. Consequently, the receivers video frequency control may need to be fine-tuned as much as 10 MHz to line up on the Ku-Band signal.
2. Most Ku-Band channels use inverted video. The receiver must therefore be equipped with a video invert switch to correctly process the Ku-Band video as required.
3. Some Ku-Band programmers have a habit of changing frequencies without notice. this is often the case with live feeds, so you sometimes have to keep your finger on the channel selector while viewing one of these feeds.
4. Accurate aiming of the dish is much more critical at Ku-Band than at C-Band. This is especially true with larger dishes. A twelve-footer will have a beamwidth of less than 0.5 degrees.
5. Mesh and perforated dishes designed for C-Band reception will work at Ku-Band, but with only about 40% efficiency. This means that about 8 feet is the minimum size mesh or perforated dish that can be used for Ku-Band reception.

So if you always wanted to be a satellite pioneer, here's your big chance. But you had better start soon. If the amount of interest shown in Nashville by some of satellite TV's most seasoned professionals is any indication, there will be lines forming soon to purchase Ku-Band compatible systems.

You can pick up Ku band - *All it takes is a small (about 2-1/2 foot) dish and Ku equipment. Or you can convert your present C-band system. This requires improvising a special plate to hold the smaller Ku band feedhorn and Low Noise Amplifier.*



Tiny but powerful - Chaparral's new Ku SuperFeed.

New Products Make It Possible To Pick Up Both Bands On Your Present Equipment

Some of the most exciting new products introduced at the recent SPACE/STTI Show in Nashville are the receivers, LNBs, and feedhorns designed to receive the new generation of K-Band (12 GHz) satellites. Some of these components have the capability of being adapted to many of the home systems currently in operation.

Many system owners will use a small (5-6 ft.) solid dish dedicated to 12 GHz reception, while their current larger dish receives the more common C-Band (4GHz) broadcasts. The signals from each dish are fed into one receiver through an A/B switch. This type of system will allow the versatility of receiving both C-Band and K-Band satellite television.

There are several specialized components that are needed to convert a system to 12 GHz reception:

12 GHz FEEDHORN

Probably the most noticeable thing about 12GHz feedhorns is their small size. Less than two inches long, the Chaparral 12GHz Super Feed™ looks like a miniature 4GHz feedhorn. Mounting these small feedhorns at the focal point requires special care since the beamwidth of the dish is quite narrow at the higher frequency. Only a few dish manufacturers have made their feed support systems compatible with the smaller units. Chaparral's new 12 GHz Polarotor™ I has a center mounting plate that simplifies this installation. The plate duplicates the mounting hole pattern used with most 4GHz feedhorns and is compatible with virtually all feed supports currently being manufactured. An adapter bracket can also be built to mount a 12 GHz Super Feed to your existing dish.

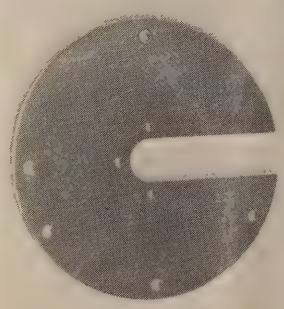
12 GHz LNB

Mounted to the feedhorn is the 12 GHz LNB which amplifies the signal reflected from the dish. It also converts the 500 MHz wide satellite band to a lower frequency. DX uses 900-1450 MHz for this intermediate frequency while

CONVERTING TO

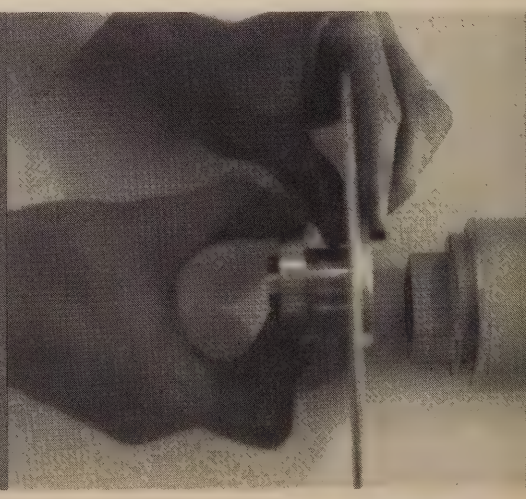
Converting a C-band dish to smaller Ku Feedhorn

Start with aluminum plate.



Mount Ku Band feedhorn securely to plate

Bolt feedhorn to LNB.



other LNB manufacturers downconvert to the more common 950-1450 MHz. The LNB output is a standard F-type connector allowing the use of light RG-6 coaxial cable to the receiver.

A/B SWITCH

The A/B Switch (also called a coaxial relay) is installed in the system to allow selection of either the 4 GHz or 12 GHz signal by the receiver. Most A/B switches are solid-state devices which use a pin diode switch. Some receivers can control the switch internally while others require an external controller. The switch allows only one of the signals to be sent to the receiver at a time.

RECEIVER

There are several receivers currently being marketed for both 4 GHz and 12 GHz reception. These receivers use the 900-1400 MHz or 950-1450 MHz input frequencies making them compatible with the 12 GHz LNBs.

Since many of the 12 GHz channels use inverted video, the receiver must have a video invert function, and because the center frequencies for the K-Band channels may be offset from the standard C-Band frequencies, a video fine-tuning control is required.

INSTALLATION

Installing a K-Band system is similar to installing a C-Band system with several special considerations:

Dish Tracking

Accurate tracking of the Clarke Belt is even more critical at K-Band than at C-Band. This is especially true of larger dishes since the beamwidth is quite narrow. Many dishes currently designed for dedicated K-Band reception do not use the polar mount. However, as the number of satellites broadcasting on this frequency increases, the need for super-accurate motor-driven polar mounts will become more important.

Feedhorn Alignment

The focal length of the dish is the same for both 4 GHz and 12 GHz signals, however the focal point is only 1/16-inch inside the throat of the 12 GHz feedhorn. The lateral and rotational alignment is also critical in order to maximize the efficiency of the dish.

A design for offset mounting the 12 GHz feedhorn on an existing 4 GHz feedhorn was introduced by Chaparral at the Nashville show. This design is particularly exciting because it allows dual band (C and K) from one dish. Look for more details on the offset 12 GHz Polarotor® in future issues of Home Satellite TV.

MAKING A 12 GHz FEEDHORN ADAPTOR

Since most dishes are designed for mounting the C-Band feedhorn, it will be necessary to adapt the feed support bracket on the dish to fit the smaller K-Band feedhorn. An adaptor plate can be made to make the smaller unit fit.

The sealer rings of a C-Band feedhorn provide an excellent template for this adaptor.

You can make a plate like this with a piece of ¼" thick aluminum, an electric drill, and a sabre saw. Any machine shop can do the work for you at a reasonable cost.

Line the holes in the adaptor up with the feed support and bolt it to the bracket. Some dishes use a tripod or quadpod support. Your adaptor will fit these dishes and those using a buttonhook feed support system.

Slide the 12 GHz feedhorn into the center of the adaptor and bolt through the adaptor, feedhorn and a 12 GHz LNB.

Adjust the buttonhook or tripod if necessary to place the focal point of the dish 1/16-inch inside the center of the 12 GHz feedhorn. This is most easily done with the buttonhook type spport that allows easy adjustment by sliding the buttonhood in or out to set the focal length.

Connect the LNB to the receiver through the A/B switch using RG-6 coaxial cable.

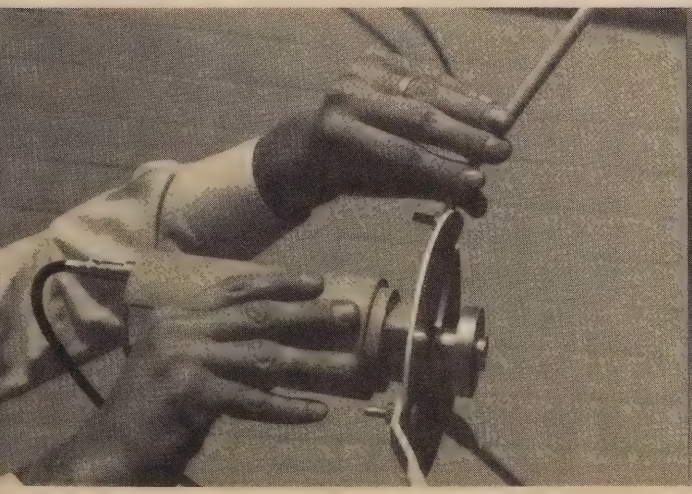
Connect the control terminals of the switch to the receiver.

After aiming the dish at the satellite, tuning the video frequency and inverting the signal as required, the polarity may be fine-tuned by rotating the buttonhook or re-positioning the adaptor on the feed support. Most current K-Band broadcasts are only using one polarity so polarity switching is not critical.

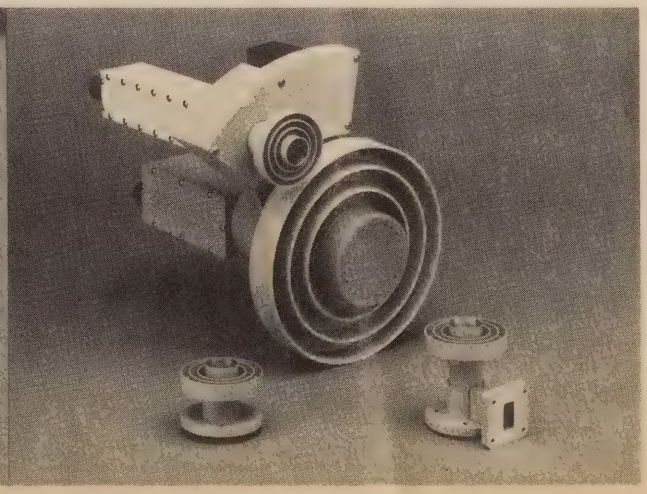
Later as dual-polarity K-Band channels are added you may wish to try the new 12 GHz Polarotor™ I from Chaparral to allow reception of all channels.

Ku BAND

Mount converted assembly to old C-band feed support



12 GHZ (Ku band) polarotor - PolarAmp LNA from Chaparral.



THE ULTIMATE REMOTE

It Takes Control Of All Your Components

There's probably no better way to enjoy a video system than to sit back in your favorite chair, pick up the remote and turn on the system.

Uh-oh. You accidentally picked up the remote for the VCR and you meant to turn on the satellite receiver. Well, that's easily corrected. Just hunt around for a few moments, there, now we have it, the receiver's remote. Now to turn on the system.

Uh-oh, that was the TV's remote. Darn!

You probably get the picture. If you have a full fledged system you end up with four separate remote controls. There's a remote for the:

Satellite Receiver
Stereo
TV
VCR

In such a system convenience leads to a handful of separate controls. We have to search to find the right one to turn on the unit we want playing. In otherwords, it's inconvenient!

Of course, that's the price we must pay for living with an evolving technology. Someday we'll be buying all of our units from the same manufacturer and one remote will be able to work them all. But as long as we have a receiver from Uniden, a Stereo from RCA, a TV from Sony and a VCR from Hitachi (or whatever other brands you happen to have), we're going to be straddled with a handful of remotes, right?

Wrong!

Tomorrow is today. You can throw away all those remotes. Now there is the ultimate remote that can operate all of your unites *regardless of what brand they may be!*

It's made by General Electric and it's the confused viewer's answer to ultimate enjoyment of video by remote control. From the one remote unit you can control your video receiver, your TV and VCR and your Stereo.

"Control Central" from G.E.

Too good to be true?

It certainly is remarkable and the GE unit does employ state of the art, even futuristic technology. But before we describe how it works, let's set up some ground rules. For this new GE remote called "Control Central" to work for you, you must first have:

1. Remote control on *each part* of your system. If you have a TV that does not already have remote control, this unit will NOT turn it into a remote. The TV, VCR, Video receiver and Stereo must each already come with a built-in remote control unit for GE's product to work.

2. Each of the current remotes must be INFRARED. That means that the signal they use to transmit commands from the remote to the TV or Video receiver must be an infrared signal. If your unit is wired or uses some other frequency, the GE remote won't work. (Of course, this isn't such a terrible limitation since the vast majority of remotes on the market today use infrared.)

Once we get past these understandable limitations, the actual operation of "Control Central" is amazingly simple. There are no complex codes to type in, no complex series of buttons to push, no unusual effort involved.

"Control Central" is able to learn the codes for our VCR, TV, etc. from our current infrared remote control. It does this quite simply. We just place our current infrared remote head-to-head with "Control Central". Then, by tapping a button we let "Control Central" know what type of unit is in front of it (a VCR remote or a Stereo remote) or whatever.

Let's say it's our TV remote. As soon as "Control Central" is set to learn, we just hit channel 2 on our old remote at the same time as we hit channel 2 on the GE unit. Our old unit flashes an infrared code, "Control Central" receives that code, analyzes it and then stores it in memory. We proceed in the same fashion with channel 3, then 4 and so forth.

When we are done, we have transferred the code for all the channels from our old remote to the new GE unit. Now, if we want to use the new unit, we simply first tap the button that lets it know it's operating the TV, then on "Control Central" we tap the button for channel 2. Instantly it sends out an infrared signal to our TV telling it to switch to channel 2.

We follow the same easy procedure for each of our audio and video units and in what takes no more than 15 minutes' time, we have programmed all of them onto "Control Central." From then on we can put each individual remote in the closet and forget about it. "Control Central" can handle ALL of our remote control needs for us!

Of course, things never are quite perfect. "Control Central" is set up primarily for TVs and stereo receivers. While it will work many of the controls found on a video receiver, there will be others (such as polarity) for which it won't have a designated button. Our choice is to either commandeer an existing button on "Control Central" for our use, or simply try to get away without using that function.

Some of the high-tech aspects of "Control Central" are really amazing, however. Once it has learned the code for our particular components, it stores them in *permanent* memory. That means that even if we turn the GE unit off and come back a month later and turn it on, it will still remember the codes we have programmed. According to engineers at GE, they have developed a process for "Control Cen-

Continued on page 22

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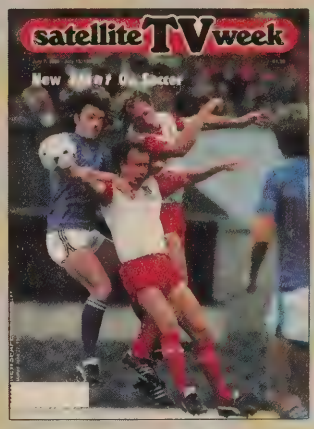

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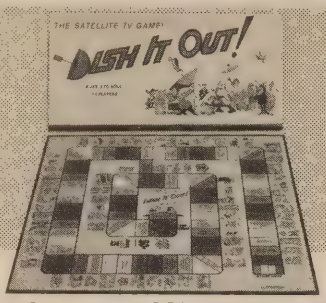

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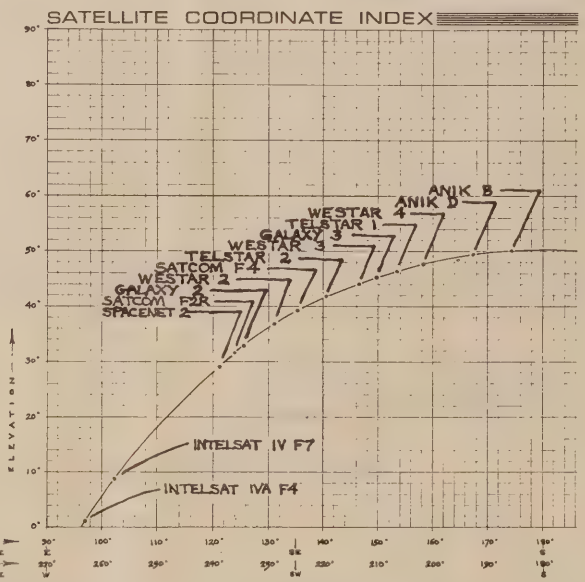

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Remote *from page 20*

tral" that allows the storage of this information in its ROM (Read Only Memory) or permanent memory.

Yet, should we wish to change any of the infrared controls we've programmed into "Control Central", this can easily be done by following the same procedure as we used to originally program information. In otherwords, we can reprogram the unit as many times as we want. And *each time* the information goes into permanent memory for recall whenever we want it. (Of course, reprogramming will erase the original signal.)

The importance of this feature is that at some time in the future we may get a new TV or Video receiver or other unit. With the reprogrammable feature we can now erase the codes for our old unit and program in the codes for our new. "Control Central", therefore, can continue to grow and expand with our system.

For those who want the actual specifications, here goes. "Control Central" uses an 8 bit microcomputer which allows it to learn different audio-video operating codes. It has a liquid crystal display.

The unit uses 4 AAA batteries and will indicate when the batteries are low and need to be replaced. It can operate audio-video products up to a range of 10 meters provided it is within 45 degrees of the component's axis horizontally and 15 degrees vertically.

"Control Central" can "read" a wide range of infrared light waves. These include:

Burst pulse
Continuous wave
ITT Single pulses
Continuous Long Wave
Single and Continuous Wave
Single and Burst
Burst and Single and Burst

To conserve its batteries, the unit will automatically turn itself off after each use. The screen goes off after two minutes.

It is compatible with virtually any brand.

The manufacturer's suggested retail price for the unit is $149.95. It should be available from satellite dealers and other stores just about the time you read this article.

Another Winner From JANEIL

We've spotted a winner, and it's backed by a champion! Janeil's new BCR5000 is a blue-ribbon quality block receiver that holds the key to successful satellite sales — customer satisfaction. It's the smart receiver that's totally automatic — no memory to lose, no need to program! Advanced circuitry and wireless remote control make it the ultimate in user convenience. Quartz lock frequency synthesized tuning circuits automatically select the exact channel, and a unique polarity circuit (patent pending) chooses format. Audio seek tuning pinpoints the correct frequency and automatically adjusts the audio bandwidth. The easy-to-use remote keypad gives your customer armchair control of direct access channel selection and other receiver functions. The Seer 9 with rack and pinion mount is one of the most accurate and popular black mesh antennas available today. It's an established champion that teams with the BCR5000 to deliver knockout reception! This customer-pleasing duo from Long's will make you a "1st Place" satellite dealer! NOTE: If you want to become a satellite TV dealer send a copy of your business license or state sales tax certificate to the attention of Mary Godsey, 2700 Crestwood Blvd., Birmingham, AL 35210

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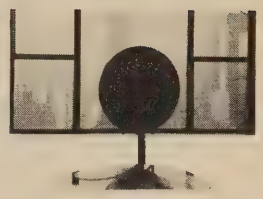
A DISH IN MANHATTAN



How One New York Sports Nut Tuned In On Ku Band

BY PETER SUTRO

You've probably been reading about Ku Band satellite transmissions and know that they are broadcast at a higher frequency than the traditional C Band transmissions which form the basis of the TVRO industry. Essentially, the Ku Band frequencies are in the 12 Gigahertz (12 billion cycles) range versus the 4 Gigahertz range for C Band and the transmitting power is in the 25 to 45 watt per transponder range versus 5-8½ watt range for C Band. This means that smaller dishes can be used to receive Ku Band signals than would be necessary to receive their C Band counterparts. It also means that the transmissions are not subject to terrestrial interference present at 4 Gigahertz and can, therefore, be used in many urban environments where the lower frequency cannot be used.

One of the most unusual installations of a Ku Band antenna was done recently in Manhattan. A sports enthusiast who wishes to remain anonymous had been trying for years to get his plush East Side apartment building in which he owns a condominium to allow him to put a 10-foot C Band antenna on the roof so that he could search the sky for more and more sports events. To this end he had installed three television sets in his living room and had Manhattan Cable hook them up. Still, he knew that he was missing a tremendous amount of programming, especially during Sundays in football season.

Unfortunately, the apartment house kept imposing more and more stringent requirements to prevent him from installing his dream dish. When they finally demanded a $100,000,000 insurance policy covering the building against all possible claims, he gave up and was about to move out of New York City to a rural home where he could have dishes to his heart's content when it was suggested that if he had a window facing south/southwest and if another, taller building wasn't blocking his look angle, then it was possible that he could watch all the NBC programming on SBS 3 with a Ku Band antenna placed *inside* his apartment looking through the picture window of his living room!

These conditions were found to exist and a 2½-foot DX antenna was installed on September 5th with excellent results. It still remained to be seen how many football games he could receive and so, on Sunday, September 8th our sports nut sat down in front of his three TV sets and waited with baited breath to watch the opening day match-ups of the 1985 NFL season. Much to his delight, he was able to *simultaneously* watch three football games at 1 p.m. EST and three more at 4 p.m. This, together with the two games on CBS and the Monday night game on ABC gave him nine football games for the week—a veritable cornucopia of pigskin! His only problem came when a violent thunderstorm erupted over New York and doused his picture window with a solid sheet of water causing his reception to disappear for about 10 minutes until the window drained dry. Otherwise, his NBC reception was better than that provided by the cable company!

Our hero has now cancelled all thoughts of moving to the country and is looking forward to seeing what else he can get on SBS 3. In fact, he called the other day to report happily that he was watching the David Letterman show at 5:30 p.m. EST and the Johnny Carson show at 8 p.m. being backhauled from Burbank to New York for later retransmission. So he is getting even more sleep these days. One dark cloud looms on the horizon. NBC, the kill-joys, are planning to encrypt the signals on SBS 3 if they can find a reliable system. However, our friend hopes that if this happens he will be able to get a decoder or that there will be so much more up there at Ku Band for him to watch that he won't care. For the time being he is a happy man.

It should be noted that there is not too much programming available as yet on Ku Band satellites, especially after the unfortunate and precipitous demise of USCI which attempted to market five channels of entertainment to homes in the north-eastern quadrant of the U.S. between November 1983 and March 1985 which resulted in a loss of over $100 million. Notwithstanding this debacle, some programming of an entertainment nature is currently available on Ku Band satellites and much more is expected in the not-too-distant future. Most notably, as noted SBS 3 carries the network programming and backhaul feeds of NBC while the G-Star satellite is now transmitting three mainstay cable programs—Showtime, ESPN and CNN Headline News for use by Holiday Inns on their Hi-Net system.

With the launching of RCA Americom's K 1 and K 2 satellites in late 1985 with 16 transponders of 45 watts of power on each satellite the number of Ku Band transponders available for video increases dramatically. One of the satellites will be used for network programming while the other will most probably carry many of the programs currently on Galaxy I such as Showtime, The Movie Channel, ESPN, CNN, Disney, WTBS and others. It should be possible to receive these programs on antennas in the three-foot range anywhere in the continental U.S.

In the heart of the city - *A tiny 2-1/2 foot DX antenna peers through a plate glass window and just over Manhattan's Chrysler building skyline to see football from across the country. On any Sunday the owner can be found simultaneously watching 3 games on 3 TV sets! He successfully switched to the Ku band system when owner's of his apartment house demanded a $100 million insurance policy to allow a C-band dish on the roof.*

The Skies Will Not "Go Dark"

The Continuous Battle With The Scramblers

"The skies will go dark," so prophesized an executive from HBO this past spring. HBO's remark was the call to arms for satellite earth station manufacturers, dealers and users nationwide to respond to the "threat" of scrambling. The idea that satellite programmers would scramble has been around for a long time and the economics of program distribution make scrambling a necessary reality. But it can be a positive experience for home satellite earth station users so long as we make sure our voice is heard and that we are treated fairly in the scrambled environment.

The first question many home earth station viewers ask is, "Why scramble satellite television signals at all?" The impetus for scrambling comes from two sources: Hollywood (the motion picture companies) and cable television companies. The "Big 8" Hollywood motion picture companies produce the vast majority of programing transmitted via satellite on the premium pay television services. In order to protect this programming, Hollywood is pressuring the pay program distributors, e.g., HBO, Showtime/The Movie Channel, to scramble their signals. In addition, cable television companies are pressuring the basic (advertisement supported) cable programming services (e.g. CNN, ESPN, MTV) to scramble their signals in order to prevent reception without payment.

One premium pay service, HBO, using the M/A-COM VideoCipher II scrambling system, is already scrambling its east and west coast feeds 12 hours a day. Several basic cable programmers including CNN, ESPN and MTV have met to discuss their own scrambling plans. The National Cable Television Association (NCTA) is also pursuing a much publicized plan to incorporate a consortium of cable operators that want to distribute the scrambled cable programming. Scrambling is truly on the horizon and a reality for all earth station users. What does this mean to the home satellite earth station viewer?

> ***"I am disappointed at the approach both CNN and ESPN have taken toward home earth station viewers..."***
>
> ***Sen. Albert Gore***

Last year, President Reagan signed into law the Cable Act which contained satellite viewing rights provisions which clarified the legality of home earth station viewers to receive unscrambled signals free of charge so long as there was no "marketing system" in place for them to pay for the signals. Implicit in the Cable Act was the requirement that if programmers wished to charge home earth station viewers to watch unscrambled signals, any payment system adopted must be pursuant to marketplace negotiation. The first to announce a scheme to collect for unscrambled signals was Turner Broadcasting Systems, which sought to impose a $25.00 fee for TVRO owners viewing Cable News Network and CNN Headline News. A few days later, ESPN began televising a commercial warning home earth station viewers that they were now required to purchase a "home receiver license" at the cost of $19.95 in order to view ESPN.

Because neither of these plans was adopted pursuant to marketplace negotiations as required by the Cable Act, SPACE took the position that the plans were without any legal effect. SPACE's position was endorsed by Senator Albert Gore's remarks inserted in the *Federal Register*. In those remarks Senator Gore stated:

These marketing plans conflict directly with Congress' intention that marketing plans adopted pursuant to Section 705 (of the Cable Act) be the result of "good faith marketplace negotiations" for the development of a system for the sale of unscrambled signals to home satellite earth station owners . . . I am disappointed at the approach both CNN and ESPN have taken toward home earth station viewers, particularly in light of the clear requirements of Section 705 . . . it is my opinion that the marketing systems these programmers are attempting to impose unilaterally on home earth station viewers are inconsistent with Section 705 of the Communications Policy Act, and therefore are invalid and have no effect.

Needless to say, the checks have not been pouring into ESPN and CNN. Some believe that the plans were put into effect by the programmers to accustom home earth station users to begin paying for signals when signals are scrambled. While believing that programmers are entitled to fair compensation for their product, SPACE does not endorse, and will not be held hostage to, payment plans that were not adopted pursuant to the Cable Act.

The adoption of satellite television viewing rights in the Cable Act was the result of extensive negotiation and compromise between the satellite earth station industry, the motion picture industry and cable interests. Consequently, the Act does not contain provisions concerning the rights of earth station viewers to receive scrambled signals. Thus, SPACE and the industry have responded to the inevitability of scrambling on two fronts.

This year SPACE has gone back to Congress to ask for legislation to in-

Continued on page 80

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Our new **Cog Drive** system eliminates most of the service problems you get with a linear actuator. No more slop in the azimuth control. No more worn out acme nuts. No more motors full of water.

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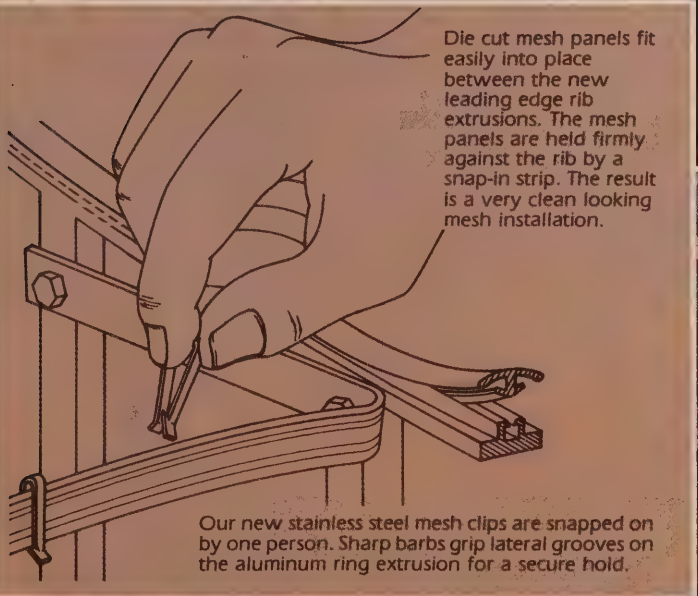

Die cut mesh panels fit easily into place between the new leading edge rib extrusions. The mesh panels are held firmly against the rib by a snap-in strip. The result is a very clean looking mesh installation.

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FIGHTING T.I.

What To Do About Terrestrial Interference, The Invisible Enemy of Satellite TV

BY TIM HARRINGTON

There could be an invisible enemy lurking near your home that could interfere with your satellite TV reception. It's called T.I. (terrestrial interference) and is something that you should know about *before* you have a satellite TV system installed. This article will cover T.I.: what it is, where it comes from and some things that can be done to help fight it.

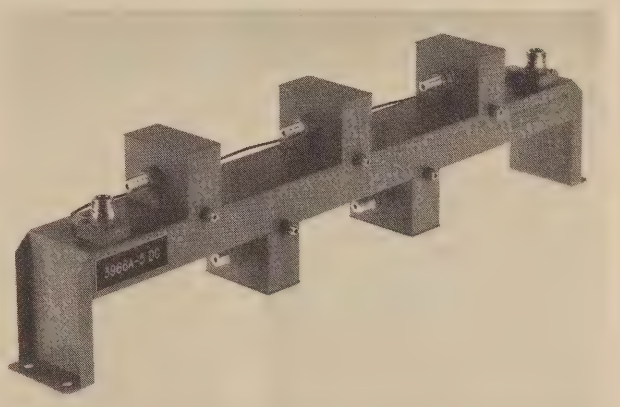
The first thing you need to know is that T.I. can be detected *before* your satellite TV system is installed. If there is T.I. present in your area, it can be dealt with in a variety of ways that will prevent or minimize its interference with your satellite TV reception.

WHAT IS T.I. (TERRESTRIAL INTERFERENCE)?

Most T.I. comes from either the microwave relay towers used by different long distance telephone companies, such as MCI and AT&T, or radar found at airports and military installations. Microwave relay towers form a national communications network that criss-crosses the United States beaming telephone and other communications from one tower to another. Unfortunately some of their channels operate very close to the same frequency as satellite TV and can interfere with nearby satellite receiving systems. These towers have dishes that transmit and receive communications in much the same manner as do satellite TV dishes. The main difference is that the dishes on the towers are communicating across the face of the earth rather than to and from satellites in space. The towers transmit a beam of microwave energy that stays within a certain path. Although T.I. travels in a straight path from one tower to another, it can be reflected by buildings and other objects and therefore head off in another direction in addition to its main path to the next tower.

Do not be lulled into false confidence just because you cannot see a microwave tower from your home. They can be miles away and still cause problems for a satellite TV system.

The villain and the heroes - *tall microwave towers produce terrestrial interference. A team of experienced professionals locate the source, then use filters and other devices to correct it. Shown with author (in red) using a spectrum analyzer is technician Charlie Beatty. James Mitchell (bottom) supports a portable T.I. shield screen.*



To defeat TI - *A microwave terrestrial interference filter can be effective, but only if selected for the specific problem.*

SYMPTOMS OF T.I.

The effect that T.I. can have upon a satellite TV system ranges from almost imperceptible all the way to total wipeout of the picture. Light T.I. usually appears as black flecks called sparklies. These sparklies can range from very few to very heavy. This symptom is sometimes blamed on faulty equipment or a poorly aligned dish when in reality T.I. is the cause. More severe T.I. appears as bars of interference rolling up the picture along with sparklies. The worst level of T.I. is almost complete obliteration or wipeout of the picture leaving a black screen.

Since most cases of T.I. come from telephone microwave relay towers, the level or severity of T.I. will usually vary at different times during the day. This is due to the fact that the number of telephone calls being handled by these towers varies. I have seen cases where there was very little interference to a satellite TV system during the day but at night some channels were totally wiped out when the level of telephone traffic peaked. Therefore it is best to check for T.I. during the time that experience has shown it to be at its highest level. In some areas this will be during the early evening and in other areas during the day.

T.I. can affect any number of channels on a system from one or more to all of them. It depends on various factors such as the level and type of interference and the number of carriers (channels) being transmitted by the microwave relay tower.

DETECTING T.I. BEFORE YOU INSTALL A SATELLITE SYSTEM

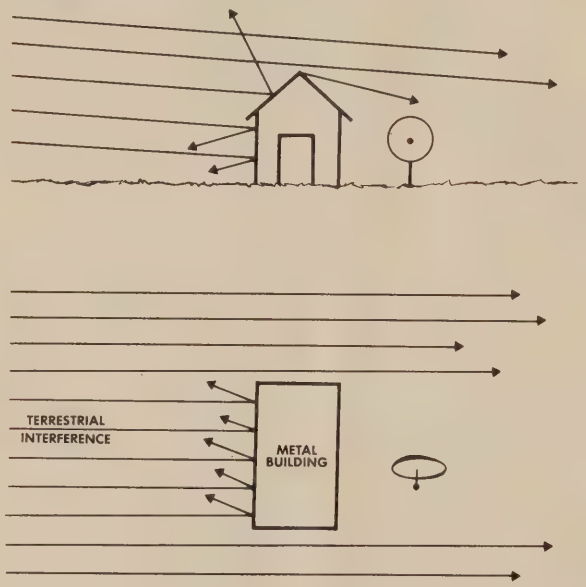
It is important that a dealer check for T.I. *before* a satellite TV system is installed. This should be a standard part of

Continued on page 30

Improves picture on smaller dishes — *Phantom's bandwidth controller also helps filter TI.*

Fight T.I.

Continued from page 29



Buildings can help shield a dish from Terrestrial Interference; metal buildings are particularly effective.

the site survey when the dealer visits the customer's home to determine where to place the dish. During this site survey the dealer should check for the presence of T.I. There are a number of ways to do this. The most reliable method is also the most trouble for the dealer and that is to actually set up a dish at the *exact* location where the permanent dish is to be installed. The exact location is critical because, as stated before, T.I. is very unpredictable and can vary significantly from one location to another that is only ten feet away. Another very effective method used by experienced dealers is to sweep the site with a spectrum analyzer. A spectrum analyzer is a specialized electronic instrument which graphically displays interference that may be present at a particular location. If the spectrum analyzer indicates that there is no T.I., then there will be no problem with interference. If there is T.I. present then it requires a dealer with a good deal of experience to accurately read the spectrum analyzer to determine if the T.I. at that particular location will be a problem. Then you and your dealer can agree on the most cost effective method to minimize or eliminate the interference.

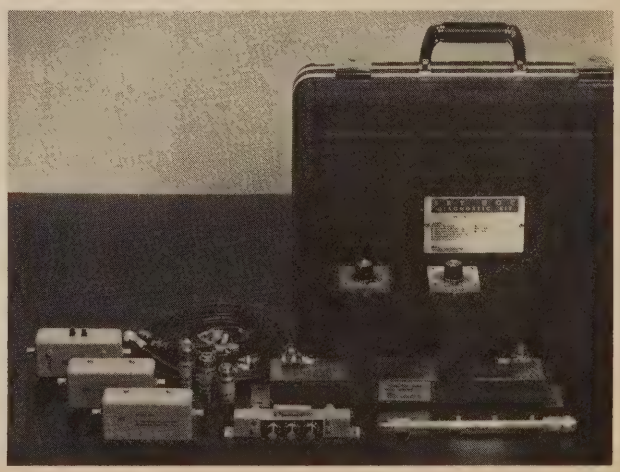
FIGHTING T.I.

There are two basic ways to deal with T.I. Please keep in mind that this is a review of the basic approaches to effectively dealing with T.I. While cases of low level T.I. can usually be eliminated with relatively inexpensive filters, serious cases require the help of a dealer or technician that is experienced in dealing with T.I. and has the proper equipment to test for it while determining a solution. Once again, do this before you buy a system.

The best way to eliminate problems with T.I. is to avoid it in the first place. If a proposed site for a satellite dish is found to have T.I., an area on the property with diminished interference called a "quiet spot" can sometimes be found. This quiet spot may exist because it is shielded by a structure such as a house or a storage building. To find this spot, equipment such as a spectrum analyzer must be used. We once installed a system on a site that had levels of T.I. that would have completely wiped out the satellite TV picture. A careful check of the property revealed a small area behind a metal storage shed that was free of interference. We installed the system without filters and it worked perfectly!

Screening to shield the dish from T.I. is another method that can be particularly effective in cases of more severe T.I. As pictured, shields can be built to block the T.I. and prevent it from being received by your dish. The number and type of screens needed will depend on the severity of the T.I. and the number of directions from which it is com-

Professional kit - *Sky Doc is an great aid for trouble shooting.*



Effective - *ESP offers an effective selection of band pass filters.*

ing. If elaborate screening is necessary it can sometimes be camouflaged by a fence or be built to look like a section of a gazebo or garden trellis. All but the most simple screening should be designed and installed by an experienced dealer. If your dealer is not experienced with trouble-shooting T.I. you can call Microwave Filter Company at 1-800-448-1666. They can usually refer you to the dealer close to you that is on their approved dealer list as having the equipment and experience necessary to deal with T.I.

In general, if T.I. is present at a site, it is usually best to mount the dish as low as possible to the ground because in many cases surrounding buildings, trees, hills or other objects may block or reduce the level or "amount" of T.I. that reaches your dish.

The next method involves filtering out the interference from the satellite receiving equipment. There are a number of filters on the market that can be obtained from your satellite dealer. Filters that are installed at the receiver range in price from $99 to $399. As you might expect, the more expensive filters usually work better in areas severely affected by T.I. There is another type of filter called a microwave notch filter that filters the T.I. before it gets into the system. These are more expensive and have to be custom tuned and installed by a dealer with extensive T.I. experience. These are usually out of the price range of individuals if more than one or two channels are affected by interference because when using this type of filter you must purchase a separate filter for each channel with interference.

You may wonder why the government allowed two communications technologies to be implemented that operated on frequencies that were so close that they might interfere with each other. Just a few years ago satellite dishes were used only for the commercial transmission and reception of TV and other communications such as telephone and data. The cost of satellite reception equipment was so high and the dishes so large that no one in government ever imagined that there would ever be such a thing as home satellite TV. As you can guess Yankee ingenuity came into play and pioneers such as Bob Cooper, Taylor Howard and others assembled their own satellite TV systems using a mixture of surplus commercial equipment and homebrew electronics to receive good quality pictures on 12-foot and smaller dishes. Thus, home satellite TV was born. Commercial satellite dish installations and microwave towers were required to be licensed, a method which allowed the government to control both of the technologies so that one did not interfere with the other. Once a commercial dish site was licensed in a T.I. free area, microwave tower paths would not be allowed to cross the path of the commercial dish and interfere with it. Home satellite system are not required to be licensed and hundreds of thousands of them have been installed with little or no concern for T.I. When the home satellite TV industry was in its infancy dealers simply put systems in and hoped that there was no T.I. When T.I. was a problem for a newly installed system, the dealer either had to attempt to filter it or remove the system and return the customer's money.

I recommend that you find a reputable dealer that has the experience to check for T.I. *before* you buy a system so that you can determine if there will be an additional cost for dealing with it. It is much easier to negotiate this with a dealer before the system is installed and paid for.

TECHNICAL CORNER

There are two basic types of T.I. filters, microwave and IF (intermediate frequency). Microwave filters such as the Microwave Filter Company's shown, actually filters the microwave interference while still at 4 GHz before it enters the downconverter. This can be particularly effective when T.I. is severe and overloads the downconverter. IF filters as their name implies, filter the T.I. after it leaves the first stage of downconversion. There are two types: notch and bandwidth. A notch filter literally notches out a small portion of the signal below and/or above the IF frequency where the T.I. is situated. Bandpass filters do the opposite by blocking out everything but the desired signal. My personal experience to date has been that when using IF filters, the bandpass type have been somewhat more effective than notch.

I wish to thank the staff at Microwave Filter Company for their help and continued support in dealing with T.I. They literally wrote the book on T.I. in that they offer an excellent manual along with a complete line of T.I. filters. They can be reached at 1-800-448-1666, 6743 Kinne Street, East Syracuse, N.Y. 13057.

Products Mentioned:

ESP T.I. filter (IF)
ESP Inc.
2532 Regency Rd.
Lexington, KY 40503 1-800-TICURES

Sky Doc Kit - Complete T.I. analysis kit
Microwave T.I. notch filter
Microwave Filter Company
6743 Kinne Street
East Syracuse, N.Y. 13057 1-800-448-1666

Phantom Superfilter - SF series
Phantom IFP1x bandwidth limiter
Phantom Engineering
16840 Joleen Way, E2
Morgan Hill, CA 95037

HOT HIGH TECH

The Latest Home Satellite Trade Show Reflects The Industry's Total Health

Every field of endeavor goes through growth and transition. The home satellite field is no different and those who are just coming on board as well as veterans sometimes wonder just where are we? Have we finally matured? Are we maybe starting on the downside?

Relax—as witnessed by attendance and enthusiasm at a recent trade show in Nashville, this field is exploding! We are in a growth phase that's probably only been paralleled by the computer field when it took off in the very early 1980s.

The show was held at Opryland, the Grand Old Opry Hotel and Convention Center. It happens to be one of the largest and plushest of such facilities in the country. Even so, it was taxed to its full capacity by the satellite show. There were hundreds of dishes in the parking lot (making finding a place to park a car a real chore!). Inside, the convention center floor was filled to capacity. So was an additional overflow room. So was a lobby which at the last minute had been converted to convention use so that additional exhibitors could be allowed room.

Keep in mind that this was *not* a show for the general public. In fact, the public was discouraged from coming both by a lack of publicity and by stiff registration fees. Rather, this was a show where manufacturers and wholesalers could present their new lines for next year to dealers. Those in attendance were strictly dealers. And there were over 10,000 of them the first day! They came to see, to hear and to learn.

The dealers had good reason to be excited. According to Chuck Hewitt of SPACE (Society of Private and Commercial Earth Stations), the current rate of sales of new home satellite systems is topping 70,000 PER MONTH! You read it correctly. The best figures indicate that 70,000 new home receivers are set up each month. That means that 1985 could see as many new systems go into operation as were set up in the previous five years combined!

The numbers are staggering and they weren't missed by our elected representatives. To encourage and support the field House of Representatives member Charlie Rose delivered a talk to capacity filled giant auditoriums. Bringing a message from Senator Barry Goldwater, who could not be in attendance, was his legal aid Terry Emerson. And on the last day of the show Democratic Senate leader Jim Wright was in attendance.

The interest by political figures in the home satellite field transcends parties and politics and goes to the heart of a key constitutional issue—representation. Many see the home satellite field as creating a new national village. A constituency which can be directly reached by satellite transmission. In otherwords, just as in pioneer times, this field offers the opportunity for elected officials to once again have "town hall" meetings where they can reach directly into the homes and the hearts of the electorate.

The home satellite field is exploding in other ways as well as was seen by the diversity of new equipment in evidence in Nashville. Block down conversion (so that the viewer can see different channels simultaneously), something that was relatively new last February at the other major show in Las Vegas, was virtually the rule here. Nearly all receivers seemed to incorporate the feature.

Horizon to horizon mounts were also in great evidence. (These allow the dish to be moved in a full arc to get a complete scan of the horizon.) They included the gear drives seen before as well as some novel chain drives and at least one unusual screw drive version.

Dishes were plentiful in virtually every size and material. However, what was new were the Ku Band dishes in evidence. (See related stories in this issue on Ku Band.) Ku Band requires much smaller dishes and there were some 2 to 3 foot varieties popping up in various places at the show. Should this trend continue, by the trade show this February in Las Vegas we might expect to see dozens, if not hundreds, of such antennas.

There were, of course, many different and exciting accessories including complete brackets for roof mounting your dish. Also catching the eye were painted dishes that turned a plain antenna into something approaching a thing of art.

Should beautifying your dish be on your mind, there was even a manufacturer in attendance who was selling a beach umbrella style cover. Just place it over your dish and no one would know you had anything more than a sun shade. (He claims that there is no reduction in reception because of the unit.)

The Hughes display was of interest because of what it suggested for the future. Prominently displayed were references to "DBS", Direct Broadcast Satellite. This is the much maligned terminology for the field that failed to live up to its promise, a few years back, of small dishes. We had been told that we would only need two foot dishes because DBS would broadcast a strong and clear signal. But it never happened.

Now, there was Hughes, who sent up the Galaxy satellite, saying the DBS was coming back. I talked with their representative and he indicated that it would be Ku Band. Within a matter of months Hughes would have satellites up there broadcasting at upwards of 45 watts of power (compared to around 5 watts for current C Band birds). "You'll only need a two foot dish for that," he exclaimed enthusiastically. "By 1989 we plan to have birds up with 100 watts of power. You will be able to receive with a hub cap, then!"

Well, maybe not, but pretty close.

One thing's certain, the technology is booming, the interest is there and this is a field that's growing by leaps and bounds.

Satellite excitement - *10,000 people the first day saw hundreds of dishes and thousands of products. The Nashville show was the biggest ever.*


uniden

The CROWD In The SKY

Plans For New Satellites Mean That Some Already In Orbit Will Have To Move

Home Satellite TV

BY BOB WOLENIK

The satellites are moving!

If you're new to home satellite reception, be aware that this is a revolutionary occurance. The satellites or birds are kept at 22,300 feet above the equator in precise locations and beam their signals down at earth so we can watch home TV. For them to be moving is more than just a little unusual.

Of course, they're not moving far and not all are involved in the musical chairs episode. Rather, only a few are moving and then to new stationary positions. If it all sounds confusing, just read on. *Continued on page 36*

NASA Illustration

The Crowd

Continued from page 35

Satellites are carried into orbit either on top of rockets or in the Space Shuttle. Once in their correct orbit, their speed matches the gravitational pull of the earth *almost* perfectly so they seem to be hanging suspended in space in an arc over the equator. It's important to understand that the qualifier "almost" is used here. Things don't quite work out perfectly. This means that to maintain their positions the birds are constantly firing tiny rockets that keep them stable. It's these tiny rockets that are now going to be put to a greater use.

Space, at least that space in the Clarke belt 22,300 miles above the equator, is getting crowded. As more and more satellites are launched, they are packed closer and closer together.

At one time these satellites were something like 6 to 8 degrees apart. (That just means how much of the arc above the equator was between them.) Recently they have been 4 to 5 degrees apart.

But now, to accomodate the traffic jam of satellites the Federal Communications Commission has decreed that henceforth we will have 2 degrees spacing. The birds will be much closer together. As a result, many of the birds will be using their tiny rockets, directed by guidance from earth, to move from their present positions to new ones.

For those of us who have home satellite receivers this could be the start of problems (it probably won't be, as we'll see). The reason has to do with something called "beamwidth." Beamwidth is essentially how wide is the beam on which our antenna focuses to receive a signal.

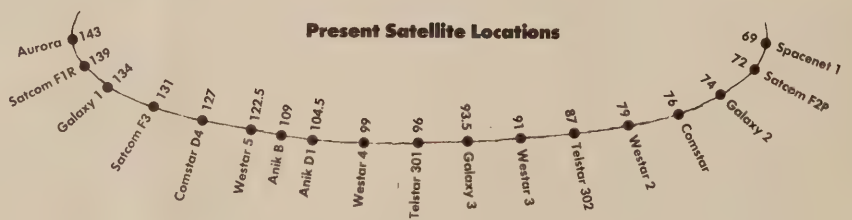
When the birds were 4 or 6 degrees apart, the beamwidth wasn't critical. When the birds are 2 degrees apart it is. In otherwords, with the birds closer together, the beam from one bird could overlap the beam from another.

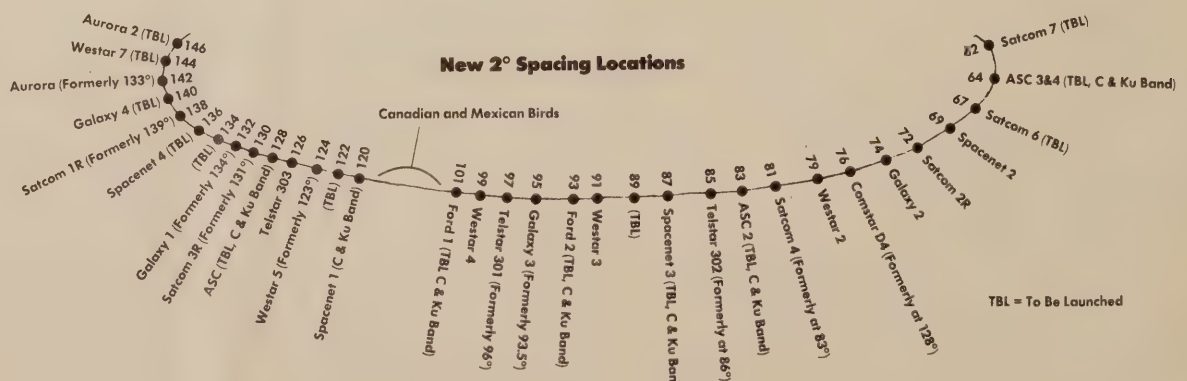
Think of it in terms of your dish here on earth. You are aimed at Galaxy 1 at 134 degrees west. Right next to it is Satcom F1R at 139 degrees west. However, because there are 5 degrees spacing between the two birds, you have no trouble picking up either one. Simply by rotating your dish you can receive EITHER Galaxy 1 or Satcom F1R.

But now 2 degree spacing goes into effect. Galaxy has moved to 132 degrees west. But right next to it at 130 degrees is Satcom 3R. You aim your dish at Galaxy, but instead of getting a clear signal, you get interference from Satcom. You aim at Satcom and you get interference from Galaxy.

Note, we're not talking about signal strength. Both signals are plenty strong enough and that's the problem. At 2 degree spacing the bandwidth is so small they can overlap.

How can the problem be solved? One answer is a larger antenna. The larger your dish, the smaller the bandwidth you can receive without interference. At 2 degrees spacing, you would probably need a dish somewhere in the 12-foot range (depending on your location in the country.) For most home satellite users that would come as a big shock because most dish-





es currently in use are in the 6 to 9-foot range.

Don't panic! Before you rush out to buy a larger dish or chew out the dealer who sold you a smaller one, rest assured that the FCC has thought long and hard on this problem. The interference of the birds has been a big concern and they have developed a means that they feel will solve the problem.

They are having satellites move to new positions where their polarity will provide protection against interference.

Polarity, as users of home satellite receivers well know, refers (at least in this country) to whether the channel is horizontal or vertical. The idea is that while Galaxy will have one polarity (where, for example, the even channels are vertical), the neighboring Satcom will have an opposite polarity (where, for example, the even channels are horizontal).

Thus when you tune in channel 4 on Galaxy, you won't have to worry about interference from channel 4 on Satcom because they will have opposite polarities.

Does this solve the problem?

Somewhat. It amounts to institutionalizing what is effectively 4 degrees spacing. Since the satellites will alternate polarity, every other satellite will have the same polarity. That means that interference will be 4 degrees away. It's a whole lot better than two, but it could still be a problem for those with the smallest dishes.

"Two degree spacing is going into effect...But will alternating satellite polarity be enough to avoid interference on existing systems?"

Ku BAND SPACING

Interestingly the new spacing applies not only to the current C Band satellites, but the up and coming Ku Band birds as well. Plans call for the Ku satellites to be placed concurrent with the C Band birds. That means that potentially at every slot where a C Band bird is nested, a Ku Band bird could be nested as well.

Present Satellite Locations

69	Spacenet 1
72	Satcom F2P
74	Galaxy 2
76	Comstar
79	Westar 2
87	Telstar 302
91	Westar 3
93.5	Galaxy 3
96	Telstar 301
99	Westar 4
104.5	Anik D1
109	Anik B
122.5	Westar 5
127	Comstar D4
131	Satcom F3
134	Galaxy 1
139	Satcom F1R
143	Aurora

New 2° Spacing Location

62	Satcom 7 (TBL)
64	ASC 3&4 (TBL, C & Ku Band)
67	Satcom 6 (TBL)
69	Spacenet 2
72	Satcom 2R
74	Galaxy 2
76	Comstar D4 (Formerly at 128°)
79	Westar 2
81	Satcom 4 (Formerly at 83°)
83	ASC 2 (TBL, C & Ku Band)
85	Telstar 302 (Formerly at 86°)
87	Spacenet 3 (TBL, C & Ku Band)
89	(TBL)
91	Westar 3
93	Ford 2 (TBL, C & Ku Band)
95	Galaxy 3 (Formerly 93.5°)
97	Telstar 301 (Formerly 96°)
99	Westar 4
101	Ford 1 (TBL C & Ku Band)
120	Spacenet 1 (C & Ku Band)
122	(TBL)
124	Westar 5 (Formerly 123°)
126	Telstar 303
128	ASC (TBL, C & Ku Band)
130	Satcom 3R (Formerly 131°)
132	Galaxy 1 (Formerly 134°)
134	(TBL)
136	Spacenet 4 (TBL)
138	Satcom 1R (Formerly 139°)
140	Galaxy 4 (TBL)
142	Aurora (Formerly 133°)
144	Westar 7 (TBL)
146	Aurora 2 (TBL)

TBL = To Be Launched

Will this prove to be a problem with Ku Band where the dish receivers are anywhere from a current 3 feet to a projected future 12 inches in diameter? No one knows. Except that it's unlikely the sky will be crowded with Ku Band birds for sometime into the future.

There are some interesting ramifications to all this. Neither Canada nor Mexico have yet adopted 2 degree spacing. Thus, their slots (between 101 and 119 degrees) remain in question. Perhaps they will eventually have birds at 2 degrees in those positions, but certainly not for the immediate future.

Which leads to a different question. How long before all of this takes place?

The FCC has indicated that it would like a "timely" movement of birds to their new assigned positions. But recent calls to Hughes, RCA and Western Union found executives huddled at meetings unable to give clear indications of when those moves would take place.

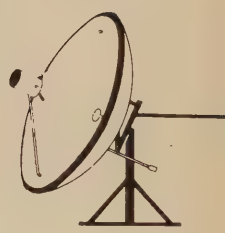
More than likely, given the way the government operates and the complexity of controlling birds in space, the moves will take time. We may be talking years instead of months.

Finally, there is the question of how many birds will we end up with? You'll need more than fingers and toes to count. However, if we don't take into consideration the Mexican and Canadian positions, then by our reckoning, that means we'll eventually have 33 positions between 62 and 146 degrees west. Those are all C Band satellites. If they were to launch corresponding Ku Band birds to the same positions the number would double to 66. Add another 8 (C and Ku Band) for Canada and Mexico and you end up with a potential grand total of 74 satellites.

That's the top figure (as of this time). In case you're planning on tuning in every one of them at one time or another and you're looking at getting an antenna positioner which has sufficient memory to recall every one of those locations, you'll probably need one with 74 slots. (If you're curious to see what changes will occur see the accompanying graph which lists present and future positions for the birds.)

Two degree spacing appears to be a permanent part of our satellite viewing. Hopefully, by controlling the polarization format it won't become a problem. As the birds move, we'll be able to move our dishes to keep them in clear focus.

Splitting Sight And Sound



Your Satellite Receiver Can Pick Up TV Programs And Top Radio Transmissions Simultaneously

BY TIM HARRINGTON

As discussed in last month's article "Tuning In The Hidden Signals On Satellite TV," there are many different types of signals relayed by satellite that are not apparent to the casual TV watcher because these signals are transmitted in formats that cannot be handled by a standard consumer satellite TV receiver. This month another type of hidden signal called FM/SCPC (frequency modulated, single carrier per channel) will be explored.

RADIO NETWORKING

While most people think of video when they think of satellite TV there is a whole world of FM/SCPC audio entertainment available by satellite if you know how to tune it in. Virtually every major league baseball team now has a satellite radio network service relayed by satellite which means that you can be a Montreal fan in Los Angeles or a Los Angeles fan in Florida (or in the Bahamas) and never miss a game. Reception is studio quality and, because these are direct feeds, the listener will often hear things that are not intended for the public.

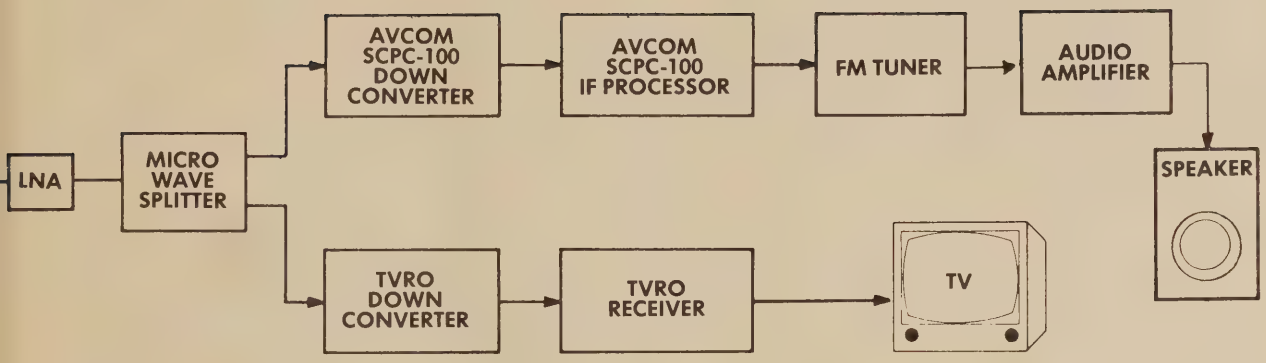
All of the radio networks supply their affiliates with multiple newscasts per hour. Between Mutual, ABC, CBS and NBC, you are never more than a few minutes from a current radio newscast. State radio networks abound; you can stay up with Florida news while in Maine or Minnesota news in Texas. Special news feeds for the Caribbean, Central and South America are also satellite relayed along with The Naval Observatory Time which is accurate to a few parts in a million. There is also a "talking book" service for the blind.

Services are spread primarily across Westar 3, Westar 4 and Satcom 1 and service is scheduled for Satcom F2 and Galaxy 2. You will usually find SCPC channels in clusters since the transmitting or uplink operators tend to group multiple users onto a single transponder for ease of switching and maximum channel efficiency.

WHAT IS SCPC?

Last month we talked about audio subcarriers which were extra sub-channels of sound that ride with or "piggyback" with the main video portion of a satellite channel. When combined with the video, these channels cost rela-

"Virtually every major league baseball team now has a satellite radio network service relayed by satellite which means you can be a Montreal fan in L.A. or an L.A. fan in Florida and never miss a game. Reception is studio quality."



Listening and watching - *the satellite signal can be split so that both can be enjoyed simultaneously.*

tively little extra to add and therefore help gain some additional use out of satellite transponders (channels) which are expensive to lease. The disadvantage of subcarriers is that they must be combined with the video at the same time and place that the video is being uplinked or transmitted to the satellite. This is where one of the main advantages of SCPC (single carrier per channel) comes in. SCPC transmissions can stand alone and be uplinked alone without any other signal. As a result, many of them can be squeezed onto one satellite channel and most importantly can be uplinked separately from different places in the country to one transponder on one satellite. (SCPC channels are audio or data that take up a small fraction of the signal as compared to video of the space on a satellite channel. This is why so many can be squeezed onto one channel.) In this way SCPC transmissions provide a very efficient use of a satellite transponder.

HOW TO RECEIVE SCPC PROGRAMMING

You can set up your satellite system so that some family members can LISTEN to satellite SCPC radio broadcasts on one satellite channel at the same time others are WATCHING satellite TV on another channel on the same satellite. This setup can be wired with additional receivers in different rooms performing different functions. The receiver tha is used for listening to satellite radio does not have to be dedicated to this function. With a simple switch or divider it can also be used for receiving regular satellite TV. There is some special equipment that you will need in addition tc your standard satellite system in order to receive SCPC programming.

"You can set up your satellite system so that some family members can LISTEN to satellite radio broadcast on one satellite channel at the same time as others are WATCHING satellite TV on another channel... on the same satellite."

If you would like to set up your satellite receiving system so that regular video can be watched while someone else is listening to SCPC channels then the signal from the LNA (low noise amplifier) at the dish will have to be split. From this microwave splitter the signal is sent to an SCPC downconverter such as the Avcom 100. The downconverter selects one transponder or channel from the satellite. This one channel may contain 10 or more SCPC channels which will then be sent to the IF (intermediate frequency) processor. From the processor the signal is sent to a standard FM receiver which is used to tune to or select a single SCPC channel. This channel is then amplified and sent to a speaker. Keep in mind that when receiving SCPC, a separate downconverter can be retuned for different transponders. Your ability to retune a downconverter will depend on your technical skills.

WHERE TO FIND FM/SCPC SERVICES

There are hundreds of FM/SCPC services available and many will have to be found by literally fishing for them by moving through the satellites and tuning through the channels. While tuning you will sometimes find a quiet spot

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Continued from page 39

which usually indicates that the channel is active but is not being used. For example Mutual Radio News may send news every fifteen minutes and be silent the rest of the time.

WHY USE SATELLITES FOR RADIO NETWORKING?

What are radio networks and why are they on satellite? The development of radio networks in the late 20s and 30s provided the foundation for the modern-day broadcasting industry we have in North America. Radio networking depended upon the ability to interconnect two or more radio broadcasting stations so that each could release or transmit the same program at the same time. The economies of networking are substantial. Networking allows a massive, national or international audience to participate in the same event or program at the same time. It also attracts national advertisers who can build their product marketing programs around their ability to reach millions of homes simultaneously.

Radio networking depended for years on the Bell Telephone Company land based telephone network for the distribution of the radio network programming. In heavily populated areas, cable carried radio network signals from town to town and city to city, dropping off "feeds" (connections to the network) at each community where there was a local broadcast affiliate. The local radio station would connect this feed to his control console and the engineer would, at the appropriate time, simply turn down the sound from the local programming and turn up the sound from the network programming. In this way local news and programs were integrated with national news and programs to make up the full broadcast day.

It has been standard practice for the network operators (Mutual, ABC and others) to pay for the interconnection service. This means that the networks have always been large users of Bell circuits and the cost to use those circuits has been substantial. Bell likes to plan circuits and systems a decade or more in advance and when Mutual, for example, went to Bell in 1960 with their network service plans, they were not discussing the network service plans for 1960 but rather for 1970. Getting Bell to move faster was not impossible but rather very expensive. The Bell network, as wonderful and reliable as it is, does not lend itself to inexpensive, rapid change; so when a special event came along that required tremendous rerouting of network services, there were tremendous charges associated with these changes.

Bell has always been limited to the technical quality of the sound it could transmit. Remember, Bell circuits are telephone lines intended for human speech and even with more expensive specialized network circuits, the quality of telephone line transmission is not comparable to the quality of satellite transmission of radio programming.

It was natural for radio networks to look with favor on the establishment of satellite linked radio network systems from the standpoint of cost, quality and flexibility. The satellite links compared favorably in cost to Bell landline circuit rental if the cost was amortized over 5 to 7 years. From a point of view of quality, the satellite links were designed from the ground up to handle high quality music programming with no degradation of the sound. Finally, whereas most radio networks rely primarily on one "circuit" for most of their transmission needs, there are occasions when a second or third circuit would give them greater flexibility. Satellite links can be "stacked" with two or more channels for a minimal increase in cost. This gives the networks an expansion capability, on short notice, that they never had with landline links.

The Mutual Radio Network was the first of the "big four" radio networks to invest heavily in the satellite linking project. Mutual began in 1978 with a proposal to equip its affiliates with what were then considered very small receiving dishes ten feet in diameter. At the time of the proposal the FCC was not allowing anyone to use 10-foot dishes for anything. You still had to have a satellite receiving license and the commission's view of small dishes was that they did not meet their technical requirements. It was at about the same time that cable system operators and the first wave of private dish owners were trying out dishes in the 10 to 12-foot range. It took the combined weight of all of these factions to convince the FCC that smaller dishes were "OK". It is therefore interesting to note that Mutual played a substantial role in changing the world of satellite TV for private citizens to the non-license status that we enjoy today.

"Bell circuits are telephone lines intended for human speech and even with expensive specialized network circuits, the quality of telephone line transmission is not comparable to the quality of satellite transmission of radio programming."

"The development of radio networks in the late 20s and 30s provided the foundation of the modern-day broadcasting industry we have in North America...The Bell network, as wonderful and reliable as it is does not lend itself to inexpensive, rapid change."

This subject is covered in greater depth in the book "The Hidden Signals On Satellite TV" and can be ordered from Universal Electronics Inc., 4555 Groves Rd. Suite 13HS, Columbus, Ohio 43232 for $14.95 plus $2.00 shipping and handling UPS or call (614) 866-4605. This article is based on information found in the book and serves as an introduction to a very broad subject. "The Hidden Signals On Satellite TV" covers the tremendous range of non-video and tele-text services that are available by satellite. The book also outlines how to receive many of these services and how to connect the additional equipment if needed, to your home satellite TV system.

An accurate up-to-the-minute listing of all video and analog subcarrier audio programming services is published six times a year by Westsat Communicators—Satellite Channel Chart—Box 434, Pleasanton, CA 94566. A one year subscription rate is $19.

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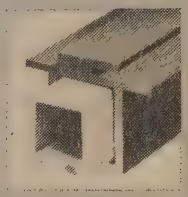

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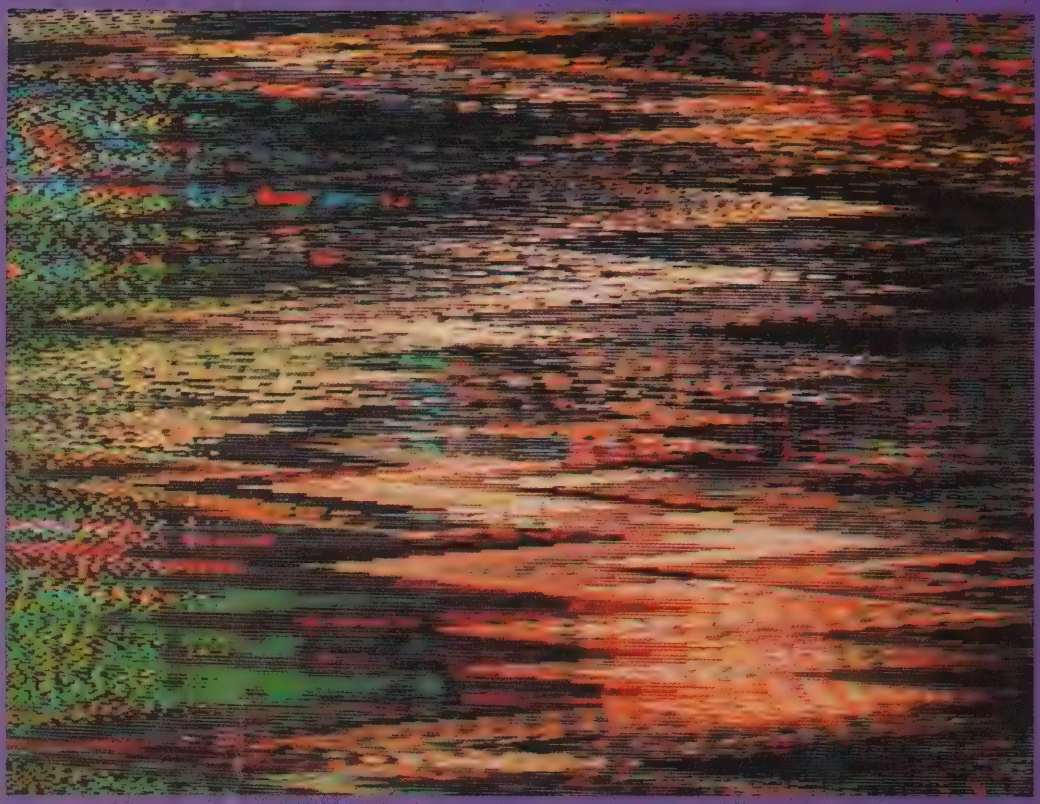


Where Are Those SCRAMBLERS And De-Scramblers?

And Which System Will Win?

Last April, HBO, the nation's leading premium channel, announced that it was going to begin test scrambling its Cinemax West signal and shortly afterward, its HBO West signal. It appeared that the dawn of scrambling might be just around the corner. Plans were soon announced that Showtime and The Movie Channel would be scrambling. Although that only represented four out of the over 117 channels available to most home satellite viewers, it nevertheless was ominous. Was it the beginning of a trend?

Since that time, however, a number of developments have occured which have confused if not deflated the scrambling threat. First was the introduction of a Bill in Congress that would defer if not eliminate scrambling. It would put a two-year moratorium on scrambling during which time programmers could provide descrambling boxes to those who wanted them.

As if in answer, HBO announced it would offer descramblers to anyone who wanted them. However, the charge was to be $12.95 per month for home satellite viewers (compared with under $10 per month actually paid by cable viewers.) M/A-COM, who is the builder of the HBO descrambler, was to provide units either directly or through HBO or through local cable operators. (Can you imagine renting a descrambler for your home satellite system from your local cable operator!?)

Almost immediately more Bills were introduced into Congress (first the House and later in the Senate) that dealt with the fairness issue. They would mandate that programmers deal fairly with all consumers. Presumably that means that a consumer who had paid for his or her own satellite system would be charged only as much and preferably less, not more, to receive a premium channel such as HBO.

Since then we've had a lot of silence. HBO has announced that it will make the descramblers available. MA/COM, the manufacturer, has announced that thousands have been produced and are being shipped.

Okay guys, where are they?

We couldn't find a single home satellite user at the recent SPACE-STTI home satellite show in Nashville (with tens of thousands in attendance) who was using a descrambler or who even knew of anyone who was using a descrambler. No one we talked to even knew where to buy a descrambler. The only M/A-COM descrambler we saw was the one on display at the M/A-COM booth.

When we asked people what they did when HBO scrambled, the answer we repeatedly received was, "We just turn to a different channel!"

Part of the problem appears to be technical. According to Bob Cooper who is considered to be the founder of home satellite TV and who is the only person we know with access to enough descramblers to test them, they have serious difficulties. The system requires individual addressing of each box. That's right, a separate code for each individual box is sent by satellite.

That's super high-tech. It might work for commercial receivers, such as cable outfits who have professional quality equipment (some have rumored that the real reason for scrambling was so that HBO could selectively turn off those cable operators who didn't pay their bills!), but it's apparently a problem for the kind of receivers that most home users have. It may turn out that for home viewers, the super sophisticated M/A-COM system won't work and will need to be scrapped.

That could be a big blow to programmers who are counting on scrambling, yet are faced with Congressional mandates to provide descramblers to private users before activating their system. (HBO has already activated its system.) Something similar happened in Europe where scrambling was tried on a large scale. Within the past few months nearly all of it (including the descramblers) have been scrapped in preference to free broadcasting.

Of course, there are alternatives to the M/A-COM system, although for some reason they tend not to be widely mentioned. One such alternative is a scrambling system produced by Scientific-Atlanta called B-MAC.

B-MAC scrambles the format of the picture during the uplink and then allows descrambling at individual receivers. According to Scientific Atlanta, this system has the enormous advantage of actually *increasing* the picture quality.

The B-MAC system is not some "pie-in-the-sky" dream. It is a viable alternative that actually works in practice. B-MAC is currently in use throughout Australia both by commercial and by home receivers. It works and it works well.

According to scientific Atlanta, there's no reason that programmers here could not have B-MAC in operation in a matter of months. And de-

Clearing the picture - *a new descrambling system called B-MAC produced by Scientific-Atlanta is readily available. Top photo is "before" and bottom is "after" descrambling. The system is already widely used in Australia.*

"USA's" descrambler uses a "key" and can be sold for only about $100.

B-Mac from Scientific-Atlanta actually improves the pictures as it descrambles.

Scramblers

Continued from page 45

scramblers are already available which can be sold to the public.

B-MAC isn't the only alternative. A small outfit called United Satellites of America operating out of Las Vegas, Nevada has come up with their own descrambler. It's as simple as the Ford that Henry invented.

This descrambler costs just $100 and works with a key. Yes, that's right. No high tech addressing of each of millions of different descrambler boxes. No electronics to go awry. Just a simple key like the kind you use to start your car or open the door of your house.

To use the system you buy the box for $100. Then you subscribe to premium channels (all of them or each separately). If you pay your monthly bill, you get a key in the mail. You insert the key in a lock on the set and it unscrambles the picture for three months.

At the end of the three-month period, your key no longer works. If you've paid your bill, you're sent a new key in the mail (with a new secret code) which unlocks your box for another three months. And so on.

Since it's every three months, billing costs and time are reduced. The key just costs a few cents to make.

Yes, it's definitely low-tech, but come on fellas, it works! You want to scramble the picture, go ahead. But provide access to descramblers at a reasonable price. If M/A-COM has problems with their system, then get it fixed or at least let's consider alternatives.

There are alternative systems both high and low tech available right now. Today, if the decisions were made, the descramblers could be on their way to consumers. Yet, where are those descramblers?

At a debate on scrambling at the SPACE-STTI dealer show with a representative of the cable industry, SPACE legal advisor Rick Brown (see his column in this issue) pointed out that in cable systems with only 500 customers, the average customer was contributing as little as only 19 cents a month to HBO for its premium service.

We don't think that any home satellite viewer would balk at paying 19 cents a month for HBO. (Maybe, if the programming gets better, we'd even be willing to pay a bit more.)

The point is that if the programmers want to scramble, there are three important facts to consider:

1. Good alternative scrambling devices and systems are available.
2. The consumer is willing to pay a *reasonable* price to unscramble a signal he or she wants to see.
3. Congress is watching.

So let's get on with it. The consumer wants action. Tens of thousands of new home satellite systems are being set up each month (70,000 new systems per months by the latest count!) The public wants its needs to be met.

It's interesting to note that the delays and foot-dragging of some major programmers is having its effect in the marketplace. Subscriptions to HBO are reportedly down. In addition, at least two commercial broadcasting systems which would provide alternatives to the premium channels *without scrambling* are well on their way.

All of which is to say that if the current players don't get their act together, they may suddenly find that they are yesterday's news and that a whole new ballgame has started without them.

Fine Tuning The FEED HORN

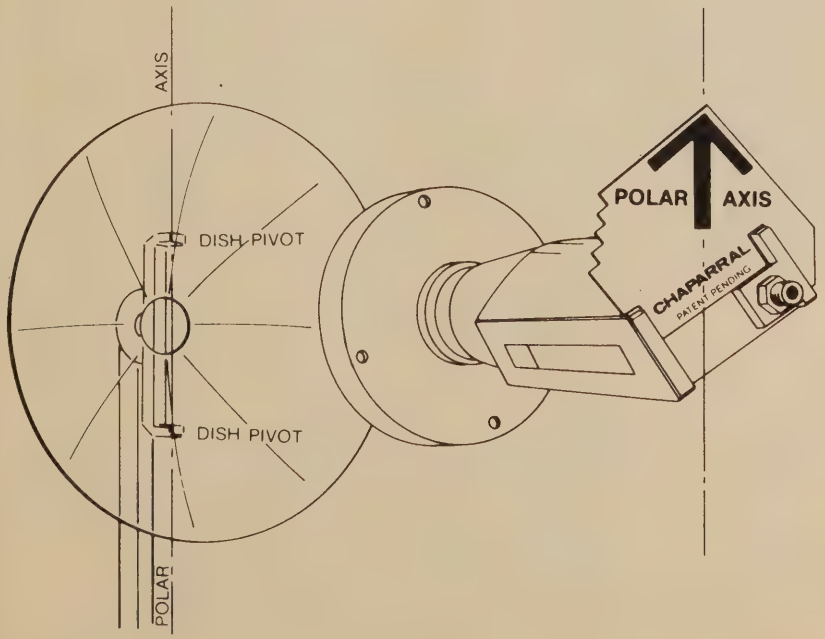
A home satellite TV system, when properly installed, is designed to give you many years of service. A few basic maintenance and tune-up procedures will add years of life to your system, and can improve the system's performance.

WHAT THE FEEDHORN DOES

It may not look like it does very much, but the feedhorn is actually one of the hardest working parts of your satellite system. The feedhorn is the part of the system that is positioned in front of the dish at the focal point. Made from cast aluminum, its unique shape is designed to direct the satellite signal into the low noise amplifier (LNA) in such a way as to utilize the dish more efficiently.

In the last issue of Home Satellite TV we discussed the correct positioning of the feedhorn at the focal point to provide the best reception. Tuning the feedhorn, receiver, and actuator to work together efficiently can also improve your system's performance, and can reduce the wear on the feedhorn's servo motor. This article features the Chaparral Polarotor I. The instructions given here can be applied to most "servo-type" feedhorns.

Figure 1.
Arrow template aligns feedhorn with polar axis.



THE POLAROTOR I FEEDHORN

Most satellite systems are equipped with the Chaparral Polarotor I. The instructions given here also apply to Chaparral's new PolarAmp LNA or PolarAmp LNB which combine the feedhorn with the LNA and block downconverter.

Inside the throat of a servo-type feedhorn is an aluminum probe that is connected to a small servo motor. On command from the receiver or actuator, the servo turns the probe to align it with the signal reflected from the dish. This signal is then picked up by the LNA which amplifies it and sends it to the downconverter and receiver.

With some receivers this little servo motor gets quite a workout. It must turn the probe 90 degrees with each change between even and odd-numbered channels to correctly align the probe with the vertically or horizontally polarized incoming signal. For example: by turning the channel selector on a Drake ESR 324 or Uniden 1000 receiver from channel 1 to channel 13, the servo turns the probe twelve times with each channel change. Other receivers allow direct access to each channel, which helps to reduce wear on the servo.

By standing next to your dish while someone changes channels, you can actually hear the servo turning the probe inside your Polarotor feedhorn. If you have a mesh dish, you may be able to see the probe repositioning with each channel change by looking through the mesh into the throat of the feedhorn. If your system's actuator is connected to the Polarotor, you'll notice that the probe turns as the dish is moved between Satcom or Telstar satellites and Anik, Galaxy, Spacenet, or Westar birds.

FINE TUNING

Fine tuning the feedhorn can help to minimize the work that the servo must do. If your system was professionally installed, you probably don't need to make any adjustments. However if you experience any of the following problems with your system, you may need to fine-tune the feedhorn:

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1. It is difficult to receive the correct picture on each channel.
2. Two overlapping pictures are received on some channels.
3. You have to adjust the receiver's SKEW control often.
4. Black bars appear on the TV screen when the Polarotor wires are connected to the receiver, and dissappear when the wires are disconnected.

If you are installing a new system, carefully follow the instructions supplied with your Polarotor I or Polar-Amp.

THE ARROW

Chaparral packages a plastic template with each feedhorn. One purpose of this arrow template is to align the feedhorn with the polar axis of the dish and polar mount. This assures that neither the horizontal or vertical positions of the probe are at the physical limits of the servo motor. See Figure 1.

The Polar axis is the imaginary line between the center of the dish and mount and the North Star, or True North. To align the Polarotor using the arrow template:

1. Attach the template to the feedhorn as described in the instruction manual.
2. Align the arrow with the polar axis of the dish. If the dish is pointing True South, the arrow will point True North or True South. If the dish is pointed east or west, the arrow will point in the same direction as the elevation angle of the polar mount.
3. Bolt the feedhorn in place so that it is aimed at the center of the dish with the correct focal length. This measurement is taken from the center of the dish to ¼-inch inside the throat of the feedhorn.

WIRING

The correct wires must be used to connect the Polarotor or Polar Amp to the receiver or actuator. See the chart for the proper gauge of *shielded* wire for various length runs.

RECEIVER ADJUSTMENTS

After alignment of the feedhorn, the following adjustments can be made to the receiver:

1. Set the receiver SKEW control in the center position. This control may be located on the front or back panel of the receiver.
2. Select a horizontal polarity channel. Refer to your programming guide to determine which channels are horizontal, which are vertical.
3. Set the receiver POLARITY switch to the horizontal position.
4. Adjust the corresponding potentiometer, located on the bottom or back of the receiver, to achieve the best picture quality.
5. Select a vertical polarity channel. If your receiver does not switch polarity automatically, set the POLARITY switch to the vertical position.
6. Adjust the opposite potentiometer to achieve the best picture on the vertical polarity channel.

Color	Function	Symbol	Alt. Symbol
red white black	plus 5 volt pulse ground	+ ⊓ ⏚	+5 control GND
Maximum cable length		Wire size	
80 feet 130 feet 200 feet 325 feet		22 gauge 20 gauge 18 gauge 16 gauge	

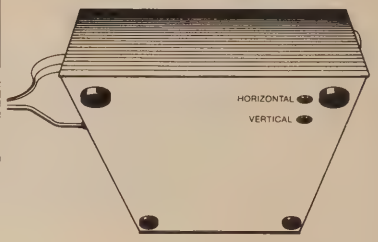

Figure 2.
Vertical and horizontal control.

NOTE: When using a hand-held controller *or* certain receivers, the horizontal and vertical potentiometers, are combined in one Delta 90 pot. The performance adjustments for these installations are made on one potentiometer. See Figure 2.

Now all vertical and horizontal polarity channels will be correct for the satellite you are currently viewing. If you aligned the Polarotor using the arrow template, the reception on satellites with the same polarity format (i.e., Telstar and Galaxy) you only need to switch the POLARITY control on the receiver to obtain the correct polarity.

There is one exception to this rule which is Satcom F3R. This satellite's polarity is skewed by 22 degrees. requiring adjustment of the SKEW control on your receiver.

Many receivers, working together with the actuator, can be programmed to switch polarity automatically as different satellites and channels are recalled, and to adjust for skew for particular channels or satellites. All of this information is stored in the receiver's microprocessor memory during installation. The latest generation of integrated receiver/actuator systems, such as the Chaparral Sierra, actually have this information programmed at the factory.

THE BENEFIT

After making these adjustments to your system, you should see a marked improvement in its performance. The largest benefit will be that you will no longer have to make manual adjustments to the polarity controls on your receiver with each satellite and channel change.

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Bringing TV To TEGUCIGALPA

The Adventures Of A Satellite Pioneer In Honduras

BY JIM VINES

Tegucigalpa, Honduras, December 14, 1981. During the last week I had completed all Christmas shopping back home in Illinois. The last colors of autumn were long gone and the now-barren countryside stood waiting for winter.

Now as I stood in the customs line with other passengers at Tegucigalpa's Toncontin Airport in what felt like a pleasant June evening back home, I reflected on the events that led to my being here.

Waiting outside in the parking lot would be the Catholic priest who first phoned me from Honduras last spring: Father Valentine.

No American military advisors were yet in evidence. Downtown, the Honduras Maya wouldn't become a hangout for U.S. and world newspeople until 1984. The "Age of Innocence" wasn't over here yet, but its days were numbered.

Few Americans know Central America as individual countries. That's a shame because Central America is quite varied and is certainly a region of great potential, as I discovered during a once-in-a-lifetime odyssey four years ago.

I had contracted with a large Catholic school in the Honduran capital of Tegucigalpa to design and install a 24.5 foot (7.46m.) TVRO antenna. The antenna would be used to provide U.S. sports and programming for priests who came in from outlying areas to "recharge" for continued priestly duties. It would also be used to provide programming for the school, which encompassed grades K through 12.

The big antenna was designed to fit in a Boeing 737, which is the craft of necessity in much of Central America where airport runways are . . . short.

Just after sunset the Tan Airlines 737 descended over Tegucigalpa, a picturebook city largely unknown to tourists and surrounded on all sides by mountains. The extremities of this city of 459,000 extended up into the clouds.

This climaxed a memorable flight with interesting travelling companions. Our flight took us across the Gulf of Mexico, where azure blue waters indicated how far west of Florida's Gulf Coast the continental shelf extends. After maintaining a good 60-mile margin from Cuba we banked southwestward toward the Yucatan Peninsula, the cradle of early Mayan civilization, where we would make a "whistle stop" outside of Belize City, Belize. During our approach we banked hard and low over the swampy coastal jungle that covers much of Belize and corners of neighboring Guatemala and Mexico.

Then on to "Tegu", after another "whistle stop" outside the northern Honduran port city of San Pedro Sula, surrounded by lush coastal agriculture and low mountains.

The sun was setting over thin cirrus clouds as we began our descent toward the Honduran capital. As we broke through the last clouds, there appeared a scene that could have been out of the Andes or the Himalayas: a picturebook city surrounded on all sides by mountains, with its extremities extending up into the clouds.

Aeropuerto Toncontin. Sixteen years earlier a fellow "flatland hillbilly" from Hoopeston, Illinois had flown here with a semipro baseball team from Guatemala. His 1965 DC-3 landing at Toncontin was that airport's first commercial arrival; and it was an occasion for celebration with the mayor and civic leaders of Tegucigalpa in attendance, as well as thousands of school children.

In 1965 Denny Noyes pulled a hanging curveball over the left field fence of Tegucigalpa's baseball park. Now I would help pull in live news and sports plus an almost endless variety of entertainment for Instituto San Francisco, one of Central America's finest Catholic schools.

And why would a Catholic school in Honduras pay to get satellite TV? "The average priest-in-the-field spends three months at a time in a remote rural community administering to the needs of his flock. He hasn't seen a U.S. newspaper or live U.S. news. Or any news from 'outside'." The voice was that of Father Valentine, as he drove along

Continued on page 53

Making contact in the third world - *Author and crew set up a 24 foot "superdish" to bring the world to a Catholic school in Honduras. First signals were of the Pope in the Vatican and of "Sandra y Paulina," a widely watched Spanish language soap opera.*

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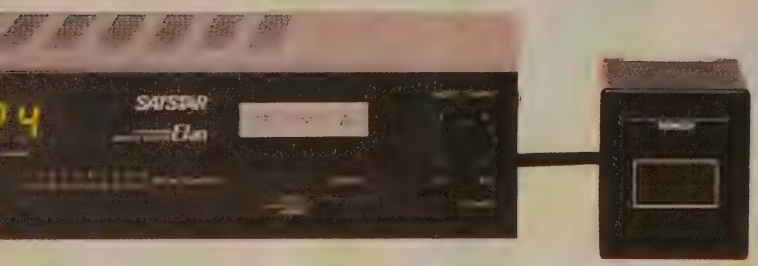

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Tegucigalpa

Continued from page 51

the dimly lit airport road that overlooked the city below.

Father Valentine again. "In addition to educating our young people, our school is a place for the rural priests to 'recharge their batteries' for a couple of weeks before going back to their communities. That's why we always keep old copies of the Miami Herald and the New York Times. Someone coming here in mid-November may not even know who won the World Series!"

"Finally, satellite TV will be a powerful educational tool for all our students."

In soccer T-shirt and bluejeans Father Valentine (Padre Valentin) looked decidedly unpriestly, more like the streetwise kid he was thirty years earlier in his native Pittsburgh. Now he was an effective shirtsleeve administrator who Got Things Done.

Why the school and convent (for recharging rural priests) are still operating let alone thriving is a bit of a miracle. Ten years earlier the Franciscan headquarters in Boston announced that they were about to close the then-insolvent and poorly-attended "Instituto". Several priests—Father Valentine included—petitioned to keep the school open.

Father Valentine continued. "A delegation from Boston met with us. They said 'All right, if you believe in this school and its mission, then *you* run it.' They gave us one year to make it work. That was in 1971."

Next morning was spent being introduced to the Instituto San Francisco staff volunteers who would help with the installation. Assembling a large antenna without experienced technicians is a chancey business. Many times over the past eight months Father Valentine assured me that he had plenty of capable people.

He was right. And because this was Christmas vacation we had plenty of volunteers, all excited about bringing satellite television to the capital of Honduras.

To legally minimize import duties—a burdensome 86 percent for finished goods—we had agreed to ship some of the antenna parts in a semi-finished condition.

The antenna—as mentioned earlier—had to be airfreighted by Boeing 737 from the international freight forwarder in Miami to Tegucigalpa. In its super-knocked-down state (to facilitate shipping) it would be a miracle if all the parts cleared Customs before I did.

They didn't.

I remained at the school to help "C-clamp" structural steel components together for welding by the school's ATSM-certified welder, Hector Alfonso Reyes. Meanwhile Father Valentine and Construction Superintendant Manuel Obondo made repeated trips to Tocontin to help customs officials find things that were "missing".

Over the next five days all of the parts were found, including the aluminum panels which had mysteriously stayed behind in Miami.

The "non-tourist" aspects of my stay were what made it so memorable and stimulating. Going on shopping errands with Samuel and Luis. Or visiting a machine shop with Alonso (where I wondered why there were so many auto engine blocks on the floor, and would later learn the Hondurans have their engines overhauled instead of buying new cars—something that should've been obvious at the time).

When the "hardline" (a semi-rigid coaxial cable in wide range usage before the advent of outdoor downconversion technology) arrived from Miami, Luis Costillo (the school's electronics consultant and an instructor at the local university), Reynoldo (the school's electrician) and I spent the better part of two days looking for a splice connector. Through their "old boy" network they found it. And I visited half of Tegucigalpa that day, including one of the local TV stations.

Along with work there was the inevitable horseplay, and one night a bunch of us walked a kilometer or so to the neighborhood cinema where "The Blues Brothers" was playing. With Spanish dubbed in. John Belushi didn't sound like John Belushi at all!

As the project progressed . . .

The fellows simply consulted the engineering photocopies I brought along and everything went smoothly. On the 20th, after all parts had arrived and cleared Customs, the antenna was assembled. My role—with the usual translation assistance from Father Valentine—was both that of consultant and participant. There was a continuation of the quiet enthusiasm for this "projecto importante."

As the big dish went together and its surface accuracy was measured to a "peak error value" of plus or minus 1/8 inch, it became apparent just how competent the "Instituto" staff members were. In Honduras as in other Third World countries one seldom has the luxury of pulling something new out of a box and plugging it in to the nearest wall outlet. Here, things are used, maintained, repaired, and reused. People here Know How Things Work, with very little formal explanation. A simple sketch, showing the "optical geometry" of the TVRO antenna, was all that was needed to impart the proper sense of urgency to be sure that the antenna was carefully assembled.

The 24-foot-plus dish was assembled quickly as well as accurately. It was completed faster than a certain heavily-advertised "installer-friendly" 16-foot mesh-surface antenna was recently assembled here in Illinois.

That evening the Merrimac SR-1 receivers and Dexcel 85 degree Kelvin LNAs arrived with Buddy Winsett (The Satellite Group, Orlando, Florida). With Father Valentine's help the receiver and LNA were cleared by Customs the next day.

The antenna would be placed high on a reinforced concrete "tower" which stood 26 feet tall. Normally it is best to place the antenna as close to the ground as possible to minimize the possibility of microwave interference. As early as July Father Valentine had advised that the future (1985) sports complex would obstruct the antenna's view, after he had reviewed the customized "Findex" plot I had prepared for this location.

In addition to being a textbook study in precision, the combined 4000-pound moving mass of dish and special "azimuth-elevation" mount were designed so that one man could manually aim it at any satellite including the feeble Intelsat birds in the eastern sky. Later the dish would be retrofitted with industrial actuators for azimuth and elevation motions; and these would be wired to a programmable control, the price of which was somewhere up in the clouds back in 1981.

Satellite signals have always been at low levels in Central and South America. This is because of U.S. satellites generally are "boresighted" toward the Western Plains States—Kansas and Nebraska. Canada's Anik D is boresighted further north, toward Winnipeg, Manitoba.

Even today what a resident of Tegucigalpa gets with his necessarily very large TVRO antenna is the remaining "spillover" signal from U.S. satellites. In the last days of 1981 Satcom F3R was launched but not yet operational. Satcom

Continued on page 54

Tegucigalpa *from page 53*

F4 hadn't been launched yet. And Galaxy One wouldn't be in orbit until August of 1983.

In 1981 the principle source of premium TV was the original and venerable RCA Satcom F1, located at 135 degrees west longitude. F1 was at the end of its seven year "design life"; and although it would continue to function on a reduced basis from another orbital slot for two more years, it was already operating at reduced power levels. Throughout the southern extremities of the U.S., Satcom F1's low signals were causing grief for cable system owners. While back in Miami I had been escorted to a condominium where a rather sloppily-installed 7-meter (23 foot) antenna's performance was still subpar after corrective work was done.

What is it like to aim a very large, very accurately-constructed TVRO antenna? You can be scarcely one degree off-target and have no visible signal. Even as the antenna is aimed slowly the signal seems to "pop" on the TV screen.

This is the kind of situation where an "azimuth-elevation" mount excels. The antenna is tilted to the elevation indicated by either a computer printout or a visual graphic such as a Findex plot. Then it is "panned" left-right-left in the Findex-indicated direction (azimuth) while the receiver is set to automatically scan all 24 channels for an active video transponder.

With an azimuth-elevation mount there is no polar axle that must first be painstakingly aligned with the Earth's axis. The "az-el" mount design is most universally employed to aim large (20-foot-plus) TVRO antennas. The extreme directivity of a *good* big dish is not "forgiving" of the tracking errors that are intrinsic to a polar mount.

Satellites were not the only thing the antenna "saw". We noticed that Pope John Paul was giving his Christmas Eve message on Transponders 17 and 18 no matter where the dish was aimed. The dish-elevated a good 36 feet above the ground—was smackdab in the middle of a very hot microwave path. The problem would be cleared up the following month, but it was annoying none the less.

After "peaking the Pope" with the satellite receiver up on the tower, we climbed groundward, went inside, and switched the indoor TV on. We wanted to see whether John Paul was being broadcast on local TV He was; on channel 5. Therefore the Pope—as observed outdoors via the satellite receiver—was being carried into "Tegu" by way of a multi-hop microwave repeater system that stretched over thirty hops and more than 1,000 miles back to Mexico City. We would later discover that this was how Tegucigalpans get "Sandra y Paulina," a widely watched Spanish language "soap opera" each weekday evening via local channel 5.

After a look-see at Westars 1 and 3 as well as Comstar D2 (all quite strong, and all subject to microwave interference at and near to transponders 17 and 18) we cranked the dish back toward Satcom F1.

As soon as F1 popped up on the small portable TV we routed the cable indoors where we transported all the equipment in the night air, now thick with the rather enjoyable odor of about two million rockets and several tons of firecrackers.

Inside, the seven-foot Kloss Nova-Beam projection TV was turned on in time for us to see a snowstorm ravaging the Midwest, courtesy of the WGN Evening News. There was much shouting by staff members. "They've never seen snow before, except in books" explained Father Valentine.

"Snow," He paused for effect, then continued. "And you're gonna get it in a couple more days!"

Time to drive the fellows home. The city lights near and far were enveloped in haze from fireworks. Everywhere we saw children from age 10 to 60 waving sparklers, throwing firecrackers or shooting rockets skyward. Christmas dinner was being cooked outdoors over open fires, adding its savory aroma to that of the fireworks.

Christmas Day. Phone home, say I'll be there by tomorrow night. We saw some more of the city and when we returned several of the fellows had wandered over to say a final goodbye and to watch some more satellite TV.

You can rave all you want to about those premium movie channels, but what most impressed these chaps was seeing live news and sports from the USA. So we pointed the dish at Westar 1 where ABC's Ted Kopel was putting the evening news together. It took a little explaining with translation added before it was understood why Kopel would wait for someone to hand him a piece of paper, why the "makeup man" would powder Kopel's face, and why he would always clear his throat several times before reading.

The day after Christmas Father Valentine, Buddy and I caught Tan Sasa's morning flight to Miami. Father Valentine was starting his yearly vacation, heading back to Pittsburgh to see his then 80-year-old mother. Each year for 17 years he had done this, and hopefully he would be able to do so for many more years.

Father Valentine was—is—a gifted administrator who would command a six-figure salary in the business world. He presided over the turnaround of Instituto San Francisco to an enrollment of 2,300 students from Kindergarten to twelfth grade, with a new university and sports complex in the planning stage.

He rescued the school from insolvency by bringing "in-house" all building construction and the mass manufacture of items such as doors and windows, door and window frames, school desks and blackboards. Jobs were created and money was saved by making items which formerly had been imported at great cost.

Someday, perhaps by the year 2050, the city of Tegucigalpa will commission a statue in Father Valentine's honor. Hopefully his likeness will be clothed in the bluejeans, T-shirt and jogging shoes that are almost a part of him. Perhaps there would be a recorded message from the man. He'd say: "We have work to do!" The voice would convey enthusiasm.

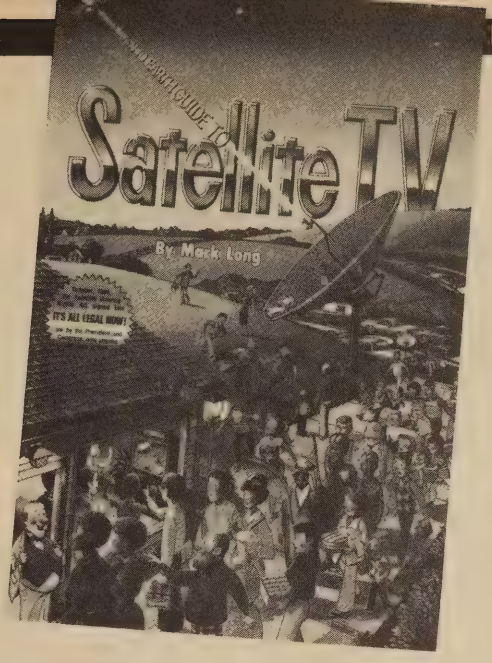
Tegucigalpa? Hopefully tourists won't soon discover it. The city has a growing economy based on commerce and industry, with an increasingly skilled labor force. Nowhere in the city or the surrounding mountainous countryside were there starving children begging for food. There are cars, trucks and busses everywhere moving people and goods. There are attractive stores with a good mix of consumer goods downtown as well as in several modern shopping malls on the outskirts of the city.

The "charm" here is of real people doing real things; and I'll take that over the "resort" types seven days a week.

If Tegucigalpa is "making it", can the rest of Honduras be far behind?

Several hours into our return flight I was gazing down across over sixty miles of blue water at a thin line on the southern horizon. Cuba.

Our dark-eyed flight attendant announced that we'd be in Miami within ninety minutes. Ten hours later I'd be shivering in Illinois.



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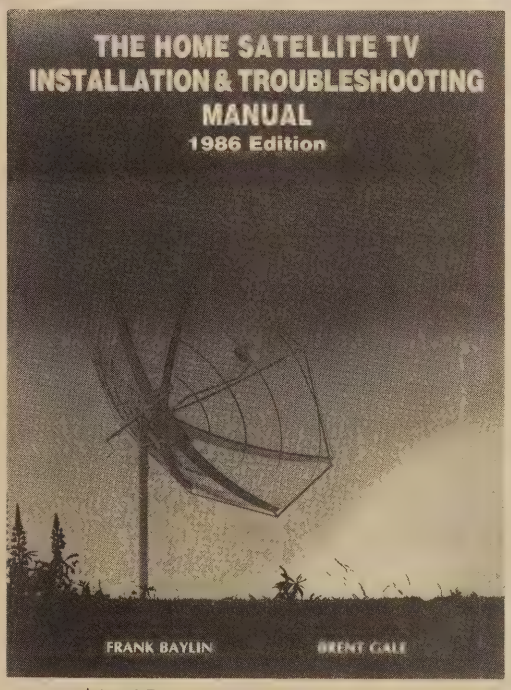

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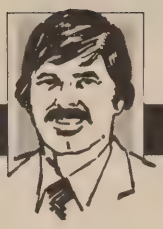

SATELLITE SPORTS by Larry Stewart

For Dish Owners: 820 NBA Games This Season

Things are looking up for the National Basketball Association, and not just because the league is filled with 7-footers.

Attendance is up, TV ratings are up and the talent continues to improve. The addition of Patrick Ewing (New York Knicks), Wayman Tisdale (Indiana Pacers), Benoit Benjamin (Los Angeles Clippers) and Chris Mullen (Golden State Warriors) to an already solid stable indicates NBA fans are in for an outstanding season.

But if you're relying solely on CBS for pro basketball, you won't get much. CBS this season will televise only 11 regular season games, the All-Star Game Feb. 9 and some, but not all, playoff games. Also, up until the final round, CBS shows weeknight playoff games on a tape-delayed basis at 11:30 p.m.

If you have cable, you can get an additional 55 regular-season NBA telecasts on WTBS. But this is ony about half as many games as were televised when both ESPN and the USA network had contracts with the NBA prior to the 1984-85 season.

If you happen to live in an NBA city, then you will also get telecasts of road games involving the local team. The Los Angeles Lakers, the Boston Celtics, the Houston Rockets and the Philadelphia 76ers televise all their road games on commercial TV. Most other teams televise around half of their road games.

Also, 13 of the 23 NBA teams are now televising home games on pay/cable TV. The Celtics, for example, televise almost all their home games on Sports Channel. The Lakers will televise 23 home games on a new cable channel, Prime Ticket Network, this season.

But if you don't live in an NBA city, the pickin's are slim, unless, of course, you own a satellite dish.

With a dish, you'll be able to pick up all but about 120 of the NBA's 942 regular-season games this season. That's roughly 820 games. And you'll get CBS's bothersome 11:30 playoff telecasts *live* at a more respectable hour.

Some games on local cable channels, such as Sports Channel or Prime Ticket, will be televised via microwave, and thus not available to dish owners. But in most of these cases the visiting team will be televising the game back to its own market via satellite and thus will be available.

"During weeknights, I can get about 70% of the games," said John Morris, the owner of Legends, a well-known sports hangout in Long Beach, California, that has a satellite dish. "On weekends, I get 100%"

"You can count on getting all of the Celtic, Laker, Knick and 76er games because those teams are on everyone's TV schedule. Say, for example, the Cleveland Cavaliers are playing the Celtics at Boston. You know that game will be televised back to Cleveland, and you can get it.

"A dish owner has to do his homework and study the guides or search around a little bit, but, guaranteed, all the big games are up there."

With dish owners seeing a lot of all 23 NBA teams this season, let's take a detailed look at each and how things stack up for the 1985-86 season:

WESTERN CONFERENCE

Pacific Division

Los Angeles Lakers: The world champion Lakers finished the 1984-85 regular-season with a 62-20 record. Only the Celtics, at 63-19, had a better regular-season record. The Lakers have waived two forwards, Bob McAdoo and Jamaal Wilkes. Their first-round draft choice, A.C. Green of Oregon State, is expected to fill the void. Center Kareem Abdul-Jabar is back for probably his last season. He says he plans to retire. Guard Byron Scott emerged as a star last season, complementing superstar Magic Johnson. Forward James Worthy, now in his third season, is also a star. The other starting forward is Kurt Rambis.

Portland Trail Blazers: They were 42-40 last season, but finished 20 games behind the first-place Lakers. Sam Bowie, 7-0, is now in his second season and should be improved. He averaged 2.67 blocked shots per game last season, third-best in the league. Another key player for Coach Jack Ramsey is Mychal Thompson, who was converted from center to power forward with the arrival of Bowie. The other forward is high-scoring Kiki Vandeweghe. Clyde Drexel and Darnell Valentine are the guards.

Phoenix Suns: Suns finished third in Pacific Division at 36-46. Suns were crippled by injuries last season, but with Larry Nance, Walter Davis and Marice Lucas healthy and with the addition of rookie Ed Pinkney of Villanova, Coach John MacLeod's team should offer Lakers more competition this season.

Los Angeles Clippers: The Clippers were 31-51 last season, but should be much improved. They traded away injury-plagued Bill Walton to the Celtics for Cedric Maxwell, who injured his left knee last February but is healthy now. Coach Don Chaney, brought in on an interim basis to replace fired Jim Lynam late last season, is now the permanent coach. Benoit Benjamin, a 7-foot center from Creighton, the third player taken in last June's NBA draft, should contribute immediately. Norm Nixon offers stability in the backcourt, where he teams with Derek Smith.

Seattle Supersonics: Sonics coming off an unusually bad season, finishing at 31-51. Bernie Bickerstaff is the new coach, replacing Lenny Wilkens, now the team's general manager. Bickerstaff is a former Washington Capital assistant coach. Sonics picked up Xavier McDaniel of Wichita State in the draft.

Golden State Warriors: Warriors and the Indiana Pacers shared the honor of having the worst record in the league last season at 22-60. They should be vastly improved this season, with the return of 7-1 Joe Barry Carroll, who played in Italy last

Continued on page 59

Going for the basket on satellite TV - *Laker James Worthy puts up the ball against Celtic Kevin McHale. Fans can pick up all but 120 of the NBA's regularly scheduled games for this season.*


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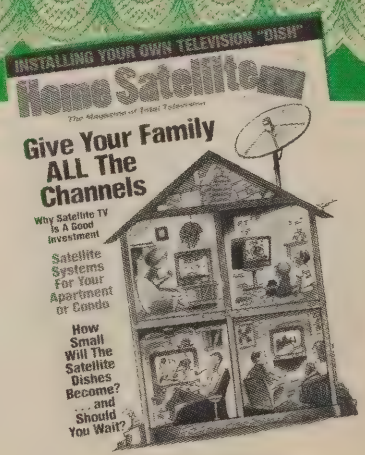

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Continued from page 57

season because of a salary dispute with the Warriors. The Warriors got Chris Mullin of St. John's in the draft. Mullin won the John Wooden Award as the best college player in the country last season. Super shooter Purvis Short was one bright spot last season, averaging 28 points per game, fourth best in the league.

Midwest Division

Denver Nuggets: The Nuggets showed considerable improvement last season. They went from a 38-44 record for 1983-84 to 52-30 for 1984-85. The reason for the improvement was a better defense. Prior to last season, they got rugged defender Calvin Natt, 6-10 Wayne Cooper and point guard Lafayette Lever from Portland for Kiki Vandeweghe. Alex English averaged 27.1 points per game last season. Center Dan Issel has retired.

Houston Rockets: The Rockets were the worst team in the league for two straight seasons before improving to 48-34 last season, good enough for second place in the Midwest Division. The reason for the improvement was the addition of 7-0 Akeem Olajuwon, who averaged 11.9 rebounds and 2.68 blocked shots per game. Ralph Sampson was moved to forward, and performed admirably. With these two coming back, the Rockets probably wil be even tougher this year.

Dallas Mavericks: The Mavericks, 44-38 last season, are loaded with talent—high-scoring forwards Mark Aguirre and Ronaldo Blackmon, center Sam Perkins and forward Jay Vincent. Aguirre average 24.6 points per game last season.

San Antonio Spurs: The Spurs, who missed the playoffs for the first time in eight seasons in 1984, barely made it in 1985 with a 41-41 record. Thier best players are 7-2 Artis Gilmore (10.4 rebounds per game last season), 6-9 George Gervin, who had an off year last season, and 6-8 Mike Mitchell. The team's top draft choice was Alfredrick Hughes of Loyola of Chicago, where he averaged 26.3 ponts and 9.5 rebounds last season.

Utah Jazz: The Jazz was also 41-41 last season. Mark Eaton, 7-5, has led the league the past two seasons in blocked shots. He averaged 5.56 last season. The former UCLA player averaged 11.3 rebounds. Adrian Dantley scored 26.6 points per game. Guard Darrell Griffith is another key player for the Jazz.

Sacramento Kings: As the Kansas City Kings last season, they were 31-51. Eddie Johnson, Larry Drew and Reggie Theus supply the offensive firepower. Center LaSalle Thompson averaged 10.4 rebounds per game last season.

"A dish owner has to do his homework . . . but guaranteed, all the big games are up there."

EASTERN CONFERENCE

Atlanta Division

Boston Celtics: Now that Cedric Maxwell has been traded to the Los Angeles Clippers, Kevin McHale will be a starter at forward this season. Larry Bird, the league's second-leading scorer with a 28.7 average last season, will start at the other forward. Robert Parish will again be the center. Danny Alinge and Dennis Johnson are the guards. Bill Walton, if he's healthy, will supply depth. The Celtics' top draft choice was Sam Vincent of Michigan State, brother of San Antonio's Jay Vincent.

Philadelphia 76ers: The Sixers were 58-24 last season, finishing five games behind the 63-19 Celtics. The Sixers have a new coach, Matt Goukas, a former assistant who moved up to replace the retiring Billy Cunningham. Julius Erving, Moses Malone, Andrew Toney and Maurice Cheeks will again be the nucleus.

New Jersey Nets: The Nets, under Coach Stan Albeck, were 42-40 last season. Albeck has since moved on to Chicago, where he replaces the fired Kevin Loughery. Former Laker assistant Coach Dave Wohl is the new Net coach. Guard Michael Ray Richardson led the team last season. He averaged nearly three steals a game, best in the league. Forward Buck Williams was the team's top rebounder with an average of 12.8. Darryl Dawkins and Mike Gminski share time at center. Another top player is Otis Birdsong.

Sports Excitement - *76er Julius Irving drives past the Celtic's Larry Bird. Games of both teams are seen on satellite.*

Washington Capitals: The Capitals, 40-42 last season, were improved from the previous season. Top players are Gus Williams, Frank Johnson, Jeff Ruland, Rich Mahorn and Greg Ballard.

New York Knicks: The Knicks were awful last season, finishing last in the Atlantic Division with a record of 24-58. But they figure to be vastly improved this season. Their biggest victory of last season came off the court when they won the lottery for the NBA's No. 1 pick. They used it to take Georgetown's Patrick Ewing, who figures to turn the franchise around all by himself. He'll take some of the load off forward Bernard King, who averaged 32.9 points per game last season, tops in the league. Center Bill Cartwright might be moved to power forward.

Central Division

Milwaukee Bucks: The Bucks were 59-23 last season, despite losing Bob Lanier, Marques Johnson, Junior Bridgeman and Nate Archibald. Lanier retired. Johnson and Bridgeman were traded to the Clippers for forward Terry Cummings and guards Craig Hodges and Ricky Pierce, and Archibald was waived. Their 1984-85 record turned out to be better than their 1983-84 record of 50-32 mainly because of Cummings, who averaged 23.6 points per game, and the all-around play of Sidney Moncrief and Alton Lister. This past September, the Bucks picked up 6-11 center Mark McNamara by giving a third-round draft pick to the Sacramento Kings.

Detroit Pistons: The Pistons, 46-36 last season, are loaded with talent. Guard Isiah led the league in assists last season with an average of 13.9. Bill Laimbeer was second in rebounding with an average of 12.4. Dan Roundfield, Kelly Tripuka, Terry Tyler, Vinnie Johnson, and Kent Benson provide depth.

Chicago Bulls: The Bulls improved from 27-55 in 1984-85 to 38-44 last season. The reason: Michael Jordan, the NBA's Rookie of the Year. Jordan averaged 28.2 points per game, third best in the league. The Bulls have picked up another outstanding rookie, forward Keith Lee of Memphis State. The Bulls have a new coach, Stan Albeck, who came from New Jersey. Albeck was previously the head coach in San Antonio and an assistant coach in Los Angeles.

Cleveland Cavaliers: The Cavaliers improved from 28-54 to 36-46 last season. Their No. 1 draft pick was Charles Oakley of Virginia Union, the ninth play selected overall.

Indiana Pacers: The big news with the Pacers, only 22-60 last season, was selected three-time All-American Wayman Tisdale of Oklahoma in the draft. He was the second player taken and some experts think he may be as good overall as the Knicks' Ewing.

'86 FIRST-TIME

What You Should Know Before Buying A Private Earth Station

BY BOB COOPER, JR.

The home satellite TV system has gradually evolved from a hodge-podge of equipment pieces 'scrounged' by electronic enthusiasts to 'pop-out-of-the-box' systems which can now be acquired 'off the shelf' complete with written instructions designed for the novice self-installer. But the maturity of the packaging is outdistancing the general level of understanding found in the average 'installation shop' so the new buyer in the field will do well to protect his investment with some preliminary 'study.' That's the purpose of this report.

Back when TVRO systems were being installed at an annual rate of well under 50,000 *per year*, the people doing the installation work were basically electronic tinkerers who followed this avocation because they (1) could make good money at it, and (2), loved what they were doing. The 'good money' part attracted a new breed of dealer/installer who professed no special love for either the system or what they were doing. This new breed of installer has been haunting the growth of TVRO for several years now. In a brief sentence, the woods are full of people who represent themselves as dealers/installers of TVRO; people who couldn't 'spell' TVRO yesterday, and who probably will have forgotten how to spell it tomorrow. It happens this way.

Distribution of TVRO hardware (those bits and pieces which make up a system) has followed some very unconventional 'lines.' In an 'established' electronics industry, such as television receivers and stereo, the major suppliers have learned that their businesses thrive best in an environment of 'controlled' distribution. RCA appoints a distribution for a state or a part of a state and the only way you can get RCA products in that area is from that specified distributor. TVRO hardware is essentially sold to anyone who wants it. There may be some restrictions (ie. you have to buy three complete systems to 'qualify' as a dealer) but the restrictions are not an impediment to a person who is determined to break into TVRO as a 'dealer.'

In the TVRO world, anyone who buys 'at wholesale' is a dealer. In some instances, a person is able to buy "wholesale' by purchasing only one system. His name ends up on a mailing list as a 'dealer.' In other instances, the distributors are trying to pull out these 'weekend warriors' who spend their idle time selling TVROs to their neighbors and friends. Some of the 'trade' magazines in TVRO claim 'dealer mailing lists' of more than 25,000 people. If each of these people were in fact qualified dealers, and each had installed his apportioned 'share' of all of the terminals installed to date, we would have each dealer with 48 terminals to his credit. That sounds like a respectable number until you look at what it takes for a firm to operate *full-time* as a satellite TVRO dealer. It works out that for a man to set up a storefront shop and support that facility, himself and an installer-helper, he needs to sell no fewer than 10 terminals per month (or 120 per year). And that's a bare minimum to just squeak-by as a full-time 'TVRO dealer.'

Because equipment is readily available at 'wholesale pricing,' a 'real dealer' who is attempting to support a storefront facility, a set of test equipment, competent help and who is building for his own future (and his customer's future) is up to his armpits fighting 'part-time-dealers' who seem to come into the business only as long as it takes them to 'move' those initial three terminals they bought to 'qualify' as a dealer.

All of this is exceedingly important to the consumer who is in the marketplace looking for his or her first home system. You can find cheaper prices at every corner in town, but you will probably have to look much longer and perhaps much further to locate a dealer who can reasonably be expected to be in business when you need service on your system. Some statistics to drive home what is happening here:

1) More than 70% of all 'new dealers' go out of business within 6 months;

2) More than 85% go out of business within 12 months.

And,

3) 55% of all new terminals will require a service call within 6 months;

4) 80% of all new terminals will require a service call within 12 months.

Now, how do you spot a reliable dealer? Simply be smart enough, by studying the available literature, to understand the nuances of the many equipment choices available now in the marketplace. If you understand the basics, and you ask the correct questions, you will defend your own investment before you write out that check.

The Antenna

Antenna size is the usual first consideration. 'How big an antenna do I need?' is a typical first-question. The answer is that you need the largest antenna you can (1) place in your yard, and (2) can afford. The antenna performance determines the performance for all of the rest of the system. You will hear statements that you can 'trade off' a smaller antenna for a 'better LNA' or 'better receiver.' That is basically an untrue statement and it rings of truth only when the LNA or receiver selected for the first (smaller) antenna was marginal in performance to begin with. We'll see why.

It is very basic that the satellites of interest to most consumers point directly into the center of the United States. People in Kansas receive stronger signals than do people in Maine or California because the satellite signals become weaker around the edges of the United States (called 'CONUS' for CONtinental United States, within the trade). When signals become weaker, the *only*

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BUYERS GUIDE

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answer to improved performance is a larger antenna.

Alas, size alone is no guarantee of performance although certainly a 8-foot diameter dish of proper design will always outperform a 6-foot diameter dish of proper design. But there are also some 8-footers which work no better than (or worse than) some 6-footers. The reason?

A parabolic dish antenna has a very specified, precision form. It is not asthetic in origin. The dish is a reflector, or signal capturing device. The dish is *not* the actual antenna; a small gadget mounted in front of the dish (called a 'feed') is the *real* antenna here. The reflector is simply like the sides on a giant funnel; the surface of the dish 'catches' the signal and 'pours' or 'directs' it into the small feed part of the system.

It is not possible to easily, and inexpensively ship antennas even six feet in diameter, so the manufacturers break the dish down into multiple parts. This means the installer must assemble those parts into a completed reflector. That's where the precision part comes in.

An antenna in parts, for shipment, must assemble in the precise parabolic shape. Some antennas are poorly designed and even with very skilled people putting them together the parabolic shape cannot be achieved. Other antennas are well designed but they have 'installation tolerances' or 'adjustments' built in and if the installer is not skilled, the antenna assembles poorly. The end result of all of this is that it is possible to end up with an antenna which is more 'egg shaped' than 'parabolic shaped.' If egg-shaped antennas worked as well as 'dish' antennas, we'd call our antennas eggs rather than calling them dishes!

It is difficult for a consumer to 'check on' the shape of a dish since variations of 1/2" or so are not readily apparent to the eye although they certainly are in terms of performance. There is one very simple check you can make of an antenna (at the dealer's shop or at a neighbor's home):

1) Take a metal measure and measure from edge to edge of the dish in two directions; from the 12 o'clock position to the 6 o'clock position, and then from the 9 o'clock position to the 3 o'clock position.

You are measuring the diameter of the dish, from edge across center to edge, at two (90 degree separated) points across the surface. If these two measurements do not coincide to within 1/2", immediately be suspicious that this antenna is not performing as well as it could. Either the designer messed up, or, the installer made an error (or both). You will detect 'out of round' antennas in this fashion and that should be a warning to you.

What about the dish materials? Don't those see-through mesh-antennas let the signal slip through while the solid antennas catch all of the signal? Not so fast!

Mesh antennas—assuming the mesh has been properly selected (and almost without exception the mesh comes from one of two national sources these days)—are not 'porous' to satellite signals. Yes, there is air there and yes you can see through. But, the holes are very tiny when compared to something called 'wavelength'; the dimension in space/air of the satellite signals. The mesh represents an 'electrically solid surface' to the satellite signals even though at optic wavelengths (ie. light, what your eye can see), the light passes through.

Without equivocation, a (properly selected) mesh material antenna is no less effective at 'catching' satellite sig-

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ANTENNAS

Manufacturer	Size	Material	Focal Length/ Depth	Price	Special Features
Andersen Scientific	2 Meter or 3 Meter	Black Mesh	—	$895	Optional Skewable Dual Polarity Package
Antenna Development	10 ft.	Aluminum Mesh	—	—	Interlocking Rim Band; 12 GHz reception
Birdview	8.5 ft.	Solid or Perforated Spun Aluminum	.39	—	Proven To Withstand Winds In Excess of 100 mph
Channel Master	6 ft., 8 ft.	Perforated Aluminum	—	—	—
Channel Master	10 ft,, 12 ft.	Fiberglass	—	—	Horizon to Horizon Mount 1 Year Guarantee. Sold as Part of a Complete System
Columbia Antenna	10 ft.	Aluminum Mesh	35.2"	—	5/10 Year Warranty
Columbia Antenna	12 ft.	Aluminum Mesh	54"	—	5/10 Year Warranty
Connifer	8', 10'	Perforated Aluminum	25", 33 5/16"	—	Horizon to Horizon Mount. Part of a Complete System
Connifer	12'	Expanded Aluminum	54"	—	Horizon to Horizon Mount. Part of a Complete System.
Drake	6-8 ft.	—	—	—	Sold as Part of a Complete System
Electromechanical Research Lab	7.3', 10'	Wire Mesh	33", 45"	$749, $895	5 Year Warranty
Focii	6½ ft.	Spun Aluminum	23 5/8"	—	4 Strut Feed Assembly
Focii	8 ft.	Fiberglass	35½"	—	4 Strut Feed Assembly
Focii	10 ft.	Fiberglass	36"	—	4 Strut Feed Assembly
General Satellite	6, 8, 8'6"	Aluminum	26.25" 32.35" 39.75"	$329 $549 $599	—
General Satellite	8 ft., 10 ft.	Aluminum Mesh	36" 46.75"	$699 $799	5 Year Warranty
GCI	4½ ft.	Fiberglass	—	$899	—
GCI	6 ft.	Aluminum	—	$1099	—
Hastings Antenna	7'11", 8½' 10', 10½', 12'	Aluminum or Aluminum Mesh	34.5" 53"	$475 $1475 (Commercial)	Survival Wind Loads 80-120 mph
Hytek/ Dexcel	8'/10'	Mesh	—	—	—
Janiel	6 ft.	Perforated Aluminum	.44	$495	Electrostatically Powder Coated
Janiel	9 ft.	Steel	.385	$695	Electrostatically Powder Coated
Janiel	10', 12'	Aluminum Mesh	.375	$675, $850	—
Jedi	55", 6'. 7½' 8 ft., 10 ft.	Fiberglass	—	—	7 Year Factory Guarantee
Kaul-Tronics, Inc.	66", 90" 1' 12"	Stainless Steel	17½", 33 5/8" 36"	—	5 Yr. Warranty Compatible at 2-Degree Spacing
Kaul-Tronics, Inc.	10 ft.	Aluminum or Zinc Plated Steel	44¾"	—	Guaranteed for 2-Degree Spacing
KLM	6', 8'	Aluminum Mesh	29¼", 32¼"	—	Horizon to Horizon Mount. Windload Up to 100mph
KLM	11', 16'	Aluminum Mesh	61", 77¾"	—	Polar Mount. 1 Box Shipping
Longview	6', 7½', 9'	Spun Perforated Aluminum	.333	Complete Systems Range From $1195-$3495	5 Year Warranty RV Systems Available

THE BIG PICTURE

The Basics of An Earth Station

BY BOB COOPER, JR.

The basic parts to your TVRO system determine how well your system will (or will not) function when installed as a complete system in your yard. Here is a guide to the system parts which make-up the TVRO 'system jig-saw puzzle.'

Antenna: What you think is the antenna is not actually the antenna; it is a reflector. That large, disc-looking gadget sitting in your yard is a collector of energy. It functions much like a concave mirror, collecting the energy arriving on earth from the satellite some 24,000 miles (more or less) distant. The reflector is shaped like a parabola, which high-school geometry taught you is 'the locus of a point moving in a plane so that its distances from a fixed point (focus) and a fixed straight line are equal.' The key words here are 'focus' and 'equal.' The parabolic shape captures energy from a source (the satellite in our case) and redirects that energy to a common *focus* point. Therefore, all of the energy intercepted by the reflector is focused to a single, common point. It is at this focus point where the real antenna (called a 'feed') is installed.

Feed: As long as the surface of the reflector is parabolic in shape, the energy intercepted by the reflector surface will reflect to a point where the feed (antenna) is installed. The feed has an opening or mouth which is designed to accept all of this reflected energy, regardless of whether that energy comes to the 'focus point' from the center of the reflector (dish) or off to a side or edge (perimeter). As long as the dish is 'parabolic in shape' (ie. not 'egg-shaped') the energy is said to be 'in phase' and it will 'add up' (as numbers add up to higher and higher totals) to make the total energy arriving at the feed greater. When a dish is warped or egg-shaped, some of the energy reflected arrives at the feed 'out of phase' and rather than 'adding up' it 'subtracts down,' actually reducing the total amount of signal energy present at the feed (that's how a larger dish can sometimes work worse than a smaller dish; some of the dish energy is 'out of phase' and it *subtracts from* rather than *adds to* the total amount of energy collected at the feed.)

Polarity Selection: Most modern satellites transmit two separate groups of satellite channels at the same time, essentially on the same frequency assignments. This is possible because the satellite takes every other channel (ie. 1,3,5) and transmits that group of channels using one common polarization (such as vertical) while at the same time the remaining channel group (2,4,6 etc.) are transmitted from the satellite in the *opposite* polarization. Think of it this way: there are 24 men on the team. 12 lay down on the ground, flat (horizontal) and 12 stand up straight (vertical). The vertical row of 12 and the horizontal row of 12 can occupy what appears to be the same space at the same time because one group is on its side and one group is up and down. At your TVRO dish there is a small 'probe' or sensor pick-up mounted inside of the feed unit. This probe is connected to a motor (or switch) so that the sensor can face one direction (vertical) or the opposite direction (horizontal) on command. When you wish to watch horizontal (polarized) channels, the probe is commanded to lay down on its side. When you wish to watch vertical channels, the probe motor moves the probe so it stands straight up and down.

Different satellites have adopted, on purpose, different polarity schemes. Galaxy, Westar, Anik (etc.) have adopted one set of polarized standards (odd numbered channels are horizontal, even numbered channels are vertical) while SATCOM and Telstar (etc.) have reversed the polarization (odd is vertical, even is horizontal). Thus TVRO receivers have a 'polarity format' switch to correspond to the system in use by the various different satellites.

Low Noise Amplification: The signals scooped up by the feed (probe) are exceptionally weak and must be amplified many thousands of times (up to 100,000 times) before they are strong enough to produce useful pictures and sound. The low noise (amplifier or block converter) system bolts directly to the feed system to amplify these very weak signals before they are passed through to the receiver proper. Low noise means that in the process of making the signals

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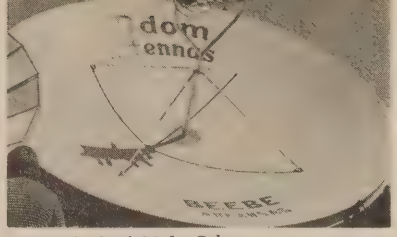
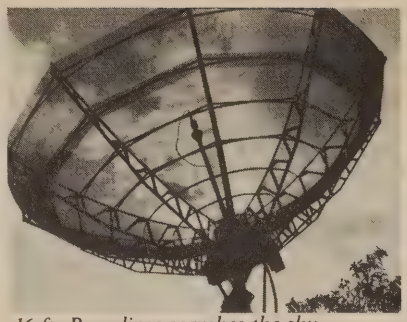


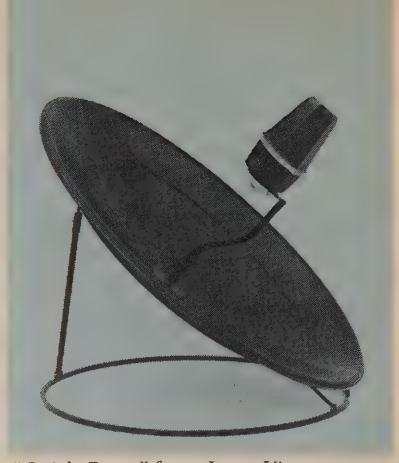
Multiple feed 16 ft. Odom.

Stainless steel Nova SS 66 Kaul-Tronics

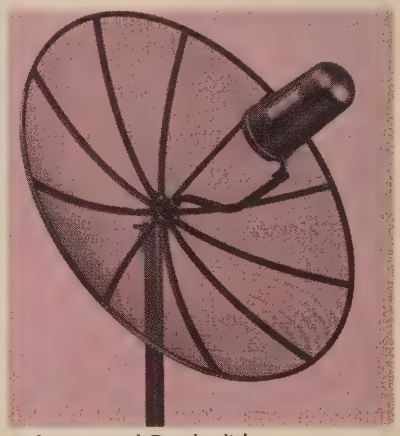


16 ft. Paraclipse searches the sky.

Steel "Space Mate" from Stolle.

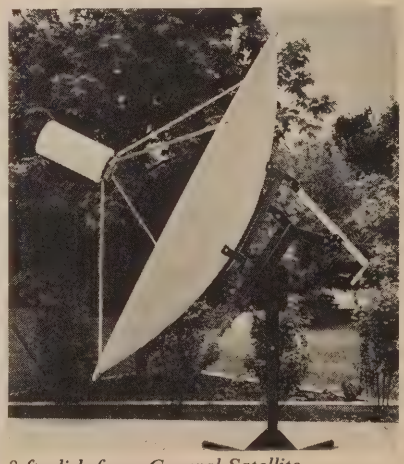


"Quick Draw" from Long View.



Pole mounted Raydx dish.

Versatile dish from PenTec MTI.



8 ft. dish from General Satellite.

ANTENNAS

Manufacturer	Size	Material	Focal Length/ Depth	Price	Special Features
Luxor	9'	Aluminum Mesh	38.5"	—	—
Luxor	10½'	Aluminum Mesh	43.24"	—	—
Mid-Tech Communications	—	Peforated Aluminum			
Miralite	2.4 Meter	Fiberglass	36.75"	—	Choice of Polar AZ/EL or Tetrahedral Mount
Miralite	3.7 Meter	Fiberglass	43.20"	—	Choice of Polar AZ/EL or Tetrahedral Mount
NSC	10 ft.	Perforated Aluminum	36"	$899	Horizon to Horizon Mount
Odom	6½ ft. 8 ft.	Fiberglass	27" 36.25"	—	5 Year Warranty/ One Piece Economical Construction
Odom	10 ft.	Fiberglass or Perforated Aluminum	36.25"-45"	—	Available in 1, 2, or 4 Piece Construction. Aluminum Dish Weighs Only 75 lbs.
Omega Systems	8 ft., 10 ft.	Aluminum Mesh	36", 45"	$665/ $750	Special Paint
Orbitron	80"	Aluminum Mesh	28.8"	—	5 Year Limited Warranty
Paraclipse	9', 12', 16'	Aluminum Mesh	43" .53" N/A	—	Tune Feed LNA Cover Pioneer Design
Pentec	10'	Aluminum Mesh	36.5"	$675	Horizon Mount
Pico	4'x7'	AVS	42"	—	Rectangular Shape
Pico	10'	Mesh	45"	—	—
Pro Sat	10.5'	Aluminum Mesh	37.8"	—	Horizon Mount; Linear Actuator
Raydx	6 ft., 8½ ft. 10½ ft.	Aluminum Mesh	—	—	—
Scientific Atlanta	2.8 Meters	Galvanized Steel	.40	$900- $1100	Designed For 2-Degree Spacing
Space Vision	10 ft.	Aluminum Mesh	38.5"	$656.68- $822.95	Two Year Warranty
Stolle SpaceMate	6 ft.	Perforated Aluminum	31.5"	$399	Size Advantage; Easily Assembled
Triangle Engineering	10', 12', 15'	Aluminum and Structural Steel	38.5"- 59.75"	$725- $1150	Coated Black On Special Order
Unlimited Fiberglass Inc.	5', 6', 7½' 9', 10'	Fiberglass	22"-36.75"	$269- $589	5 Year Warranty C Band and Ku Band
UD Superior	10.5 ft.	Aluminum Mesh	37.5"	—	—
Vidare	5', 6', 8', 10', 12', 14', 16'	Fiberglass	.30-.40		
Vidare	10'	Aluminumor Steel Mesh	.30 and .40		
Wilson	5', 7'	Spun Aluminum	27"	$1195 (Includes Receiver)	1 Year Warranty Suitable for RVs
Wilson	9', 10'	Galvanized Steel	41½", 45"	$1595 (Includes Receiver)	1 Year Warranty
Winegard	6', 8', 10'	Perforated Aluminum	20"- 33 5/16"	Complete Systems Range From $995-$2495	

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nals than a 'solid' antenna. And speaking of solid antennas, one of the most popular types of solid antenna is the fiberglass design. Now fiberglass itself *is* porous to microwave signals. You cannot catch satellite TV signals with a fiberglass sheet. So how do they work?

The fiberglass you see is a 'sandwich'; it has a front (top), a middle, and a back (bottom). The middle is a reflective material. One of the most popular and widely used 'middle' layers in a fiberglass antenna 'sandwich' is the same wire screen mesh you see in see-through antennas! The fiberglass? It is simply something to *support* the pliable screen mesh; it is in lieu of a metal framework you see with screen mesh antennas which establishes the parabolic shape for the reflector.

Which leaves us with true 'solid' antennas. They come in aluminum and steel and they come in panels that bolt together, quarter or half sections that bolt together, or they come in single 'spun' pieces. They should be stronger than mesh and more rigid than fiberglass (and more expensive than both) if they have been well designed. But performance?

Remember the tape measure trick? Just measure from 12 to 6 and 9 to 3 (o'clock) and check for dish uniformity. No one design is the best under all situations or conditions and individual antennas in any of these categories will vary from excellent to poor.

Antenna finish?

Most antennas offer a selection of colors. There has been a foolish trend to dark colored antennas in recent years; an unfortunate decision. All antennas sit outside in the sunlight. Dark colors (such as black) absorb more heat than light colors (such as beige). You probably do not want an all black car because everytime you get into it in the summer it is an oven. The same principle applies to antennas even though you don't ride inside of them. But those satellite signals do 'ride' on the antenna's surface and the 'heat' or actual temperature of the antenna surface will affect the performance of the antenna.

Any 'hot surface' has more molecules in motion than a light colored surface. When molecules 'move' they generate 'noise.' Noise is the opposite of 'signal' in a TVRO system and a 'noisy antenna' will produce poorer pictures than a 'quiet antenna.' Where possible, select an antenna color that is neutral; black is the poorest choice of all.

"Walk up to the antenna, grab an edge with both hands and shake (gently at first). If it moves with your wrists it's bad news."

The mount? That's the part of the antenna which supports the reflector surface. Most mounts these days are pipes that stick out of the ground or attach to the side of a building. Most antennas clamp to the pipe with a relatively stout 'jaw' which tightens up like a vise on the pipe. That's important because once the antenna has been 'aimed' by the installer, even small twisting of a quarter inch or so will destroy the ability of the antenna to accurately locate all of the satellites in your sky. So here are some pointers:

1) Walk up to the antenna and grab an edge with both hands. Shake the edge with your wrists, gently at first in case the antenna is a 'dog.' If the antenna moves with your wrists, it is unstable on its mount and will probably bounce around when the wind blows. That's bad news because as the antenna bounces your satellite signal will fade in and out.

2) Now walk to the rear of the mount and dish and grab the top of the pipe firmly with both hands. Push sideways, both ways. Does the entire assembly move again? A 'play' here of 1/4 inch is tolerable but anything more reflects a poor design. You are simulating stresses on the mount at this point, which can come from wind, ice, or just moving the dish with your motorized actuator.

"If the actuator you are considering does not have east and west limit switches, don't buy it!"

The Actuator

Very few modern satellite systems are sold without an actuator. This is the two-part system which allows you to control the pointing of the dish from inside the home. Some actuators have control boxes which 'stand alone' (ie. are separate) from the receiver while others are built into the receiver proper. The outdoor part is some sort of motor which receives turn on and turn off commands, as well as 'motor direction commands' from the controller inside.

There are two types of actuator dish movers or 'lifters' available.

1) Linear actuator: This is a long, thin tubular element with a small motor at one end. Inside of the tube is an expanding and contracting 'jackscrew'; literally a grooved shaft which the motor turns.

2) Horizon to Horizon drive: This is a newer, perhaps more elegant approach to moving antennas. Rather than an arm that lengthens and shortens itself on command, we have a half (180 degree) 'circle' which has gear teeth on it. A small motor interfaces to the gear teeth with a set of gear teeth of its own.

Linear actuators fail, but usually because of installer error. Improperly installed, they breathe moisture and water collects at the lowest end of the tube. This water eventually destroys the motor or the gears and the jackscrew quits jack screwing. Or, the system is installed without 'limits' or 'stops.' As the arm lengthens and the jack pushes the dish higher and higher in the sky, eventually the dish is pointing straight south. If the jackscrew keeps pushing, the antenna's weight grabs the system and the antenna falls (to the east for most installations). This can snap or bend the tube and the jackscrew and you are out of business. Most systems now employ 'limit switches' which the installer adjusts at installation time to prevent this. Some installers forget (or do not know how) to install these limits. There is this rule of thumb:

1) If the linear actuator you are considering does *not* have east and west *limit switches*, don't buy it. That is an almost certain sign that you are being offered a very cheap linear actuator which in addition to not having limit switches, probably uses recycled innersprings for its parts.

Horizon to horizon drives place all of the weight of the dish at the gear to gear intersection. That is a potential flaw in the system and unfortunately the systems are new enough that this

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approach to moving the dish around has a short-term track record. Certainly such a drive, manufacturer rated for a maximum dish size of (say) 10 feet should never be used with a 12 foot diameter dish. In other words, if the drive has been rated for maximum dish size, respect that rating.

Long term, horizon to horizon drives look like the winner here. They can point your dish into a bigger segment of the sky, they are not prone to dish 'overrun' and there are fewer potential-failure-points. The same caveat concerning 'limit switches' applies here, however; make certain the drive has installer adjustable limit switches so you don't run the dish 'off the track'!

LNA/LNB Receivers

Most modern systems have prepackaged indoor and outdoor receiver segments. The outdoor part may be called an LNB (low noise block downconverter), or simply a downconverter. You seldom have the opportunity to buy one brand of LNB or downconverter and another brand of receiver simply because these two parts are 'tuned' together to make a matched 'pair' of receiver units.

(If you are offered a system which uses one 'brand' of receiver and another brand of LNB or downconverter, it might pay to ask 'why'? Yes, a few receiver suppliers still expect the dealer to shop elsewhere for this outdoor part but most receiver manufacturers now routinely supply this part in the same box as the receiver proper.)

The first signal amplification electronics is important. With an LNB system, this signal boosting occurs inside of the LNB. In a system with its own 'downconverter,' this function occurs in a separate piece called an LNA (low noise amplifier). You shop or select LNA or LNB devices or system parts in much the same manner.

"If you are offered a system which uses one 'brand' of receiver and another brand of LNB or downconverter, it might pay to ask 'why?'"

Noise figure and gain are the two important parameters with gain the first consideration. This gets a little complicated for the average consumer but here are the basics of choice:

1) The system needs some minimum (always specified in instructions) amount of gain, in the LNA or LNB. Too little 'gain' (measured in dBs) means the system has weak, washed out pictures.

(It is also possible with some receivers to have too much gain, but we'll assume the installer knows how to correct for this with a device called a 'pad' or by making the cable run between inside and outside longer.)

2) Once you know the amount of gain required, (to match the receiver) then you make a choice based upon 'noise figure' or as it is also known 'noise temperature.'

LNAs and LNBs are rated in something called degrees Kelvin or ° K. The lower the noise temperature (smaller ° K number) the more sensitive the LNA or LNB. Typical numbers are between 65 and 100 degrees K and the lower the number the more expensive the 'piece.'

"I can sell you a 100° system for this price, or for $200 more you can have a 65° system" says the dealer. You are being asked to make a decision. But what decision?

There is a belief, prevalent among new (inexperienced) dealers that you can 'mix and match' antenna sizes and 'system noise temperatures.' According to this 'theory,' a 6-foot dish with a 65 degree noise temperature (LNA or LNB) will work the same as a 100 degree noise temperature (LNA/LNB) mated with an 8-foot dish. Do not believe it, even if the dealer seems convinced this is the truth.

Yes, a 65 is always going to be better than a 100. And also yes, a (properly designed) 8-foot will always work better than a (properly designed) 6-foot. But, the difference between a 65 degree and a 100 degree is *not the same* difference as that between an 8-foot and a 6-foot (antenna).

LNA/LNB noise temperature 'trade offs' are real, but they are typically oversold by dealers who parrot something they have heard without taking the time to verify the accuracy of what they heard. Don't be mislead by this sort of misinformation; you cannot expect the same quality pictures with a 6-foot as an 8-foot (or an 8-foot as a 10-foot) no matter what electronic options you are offered. *Period.*

"There is a belief among inexperienced dealers that a 6 foot dish with a 65 degree LNA will work the same as an 8 foot dish with a 100 degree LNA. Don't believe it even if the dealer seems convinced this is the truth."

You can probably ill-afford to get into a 'debate' with a dealer on this point; you have only our statement to go on and once you've said what we said, that's the end of your knowledge. So use this whole subject as a 'test' of a dealer's abilities and veracity. If he absolutely swears and insists he can give you a six-foot system that will work as well as an 8-foot (or 8-foot that works as well as a 10-foot) by 'upgrading the electronics,' let that be a 'red flag' to you. Perhaps it is time to walk down the street to the next shop and start over.

Cabling

Before we move inside, let's talk about how all of that outside stuff gets connected to the inside stuff. Cable, or wire is the obvious answer.

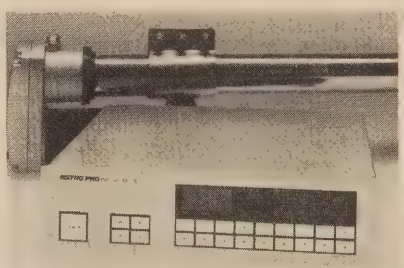
There are several types of wiring involved here. First of all, there are those wires which carry the signal from the LNB or downconverter inside to the 'real receiver.' This is a coaxial cable, round, and typically black (black *is OK* here!). Then there *may be* another piece of wire (which could also be coaxial cable) which carries operating voltage (power) to the outdoor LNB/downconverter. Again, black is OK. Plus, we have some number of wires for the motor drive or actuator gadget. Typically, there are five wires here: two to carry the operating voltage for the motor on the actuator, and three more that function as a part of the motor sensing/position circuit.

Many dealers now use a large combination wire 'bundle' where all of these individual wires are wrapped or sheathed in a plastic type of weatherproof jacket. The idea is that this type of master-sheath can be 'directly buried' in a slot-trench between the dish and the entry point to the house. This is a good concept provided:

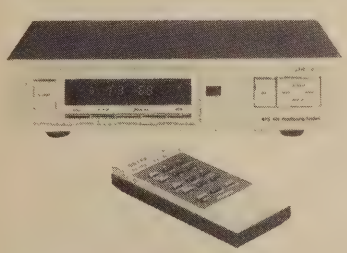
1) The sheath is sufficiently tough that rocks and sticks do not pierce the

Continued on page 68

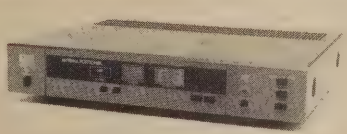
Houston Tracker IV satellite tracker



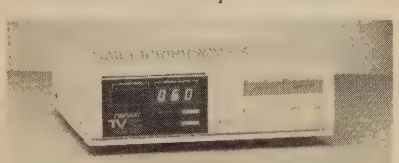
Astro Pro Z-1500 dish control



Drake APS 424 positioning system



DX DSB-400 antenna positioner



Norsat NCM-252 antenna controller

Kenwood satellite antenna postitioner

ACTUATORS

Manufacturer	Model	Remote	Automatic Recall	Interfacing	Price	Special Features
Drake	Aimer 2	No	Yes	Universal	—	Parental lockout
	Aimer 4	Yes	Yes	Universal	—	Parental lockout
Drake	APS 424	Optional	Yes	Drake ESR 240A receiver	—	LED Display
	APS 24	Yes - When used with ESR240A receiver	No	Drake ESR 240A receiver	$380	Parental lockout
DX	DSB-300/400	Yes			$173-$407	
GCI	GCI 2001 C	Yes	—	Any 36 VDC, 10 turn potentiometer actuator, and and many other receivers		LED Display illumentated antenna position
Houston Tracker	Tracker II	Yes	—			Parental lockout
	Tracker III	Yes	—			Parental lockout
	Tracker IV	Yes	Yes	Drake 324, Toki 110, Uniden 1000, Wilson 400, Dexcell 1100, 1200, Automation Techniques 500, 520, 560	—	Parental lockout
	Tracker V	Yes	Yes	Drake 240/324, Uniden 1000/ 3000, N/A Com MI, TI, HI, Toki 110, 220, 330, Luxor 9530, 9533, 9539, 9540, 9500, DX 700		Mates with Tracker System V Receiver
Janiel	AP 1000	Optional	—	—	$275.00	Non volatile memory for over 70 satellites
	AP 1500	Yes	—	BCR 2000 receiver	$525.00	Controls servo-type feed
Kenwood	KSP-1000	Yes	Yes	KSR-1000 receiver	$380	Parental lockout
Pentec	Omega 2500	Yes	—	—	$170	24 satellite capacity. Parental lockout. Large LED display
ProBrand	Astro-Pro Z-200	—	Optional	Compatible with Drake Panasonic and other name brand receivers		One year warranty Parental lockout
	Astro Pro Z-500	Optional	Yes	—	—	81 programmable positions Key & memory lock out One year warranty
ProSat	P215	Yes	—	Built in receiver interface for both digital or analog receivers		LED channel indicator can be used with receiver having no remote.
	P220	Yes	Yes	Interfaces with Drake 240A, 424 and Panasonic C2000		Parental lock out. LED readout. 72 satellite memory
	P230	Yes	Yes	Built in receiver interface		Parental lockout. LED read-out. Error warning beeper
Raydx	RXP 1 "Director"	Optional	Yes	—	—	Parental lockout
Satellite Tracking	Starlock	Yes	Yes	—	—	Parental lockout. 10 year non-volatile eeprom memory
Satrecom Co.	3600	—	Yes	—	$149	16 programmable positions
	3620	Optional	Yes	—	$169	LED readout
	3640	Yes	Yes	—	$229	99 programmable positions Parental lockout
STS	MBS-AA	No	Yes	All		Stores up to 30 satellite positions. Auto antenna positioning control
Transat	2M9	—	—	—	$575	
Uniden	UST 710	Yes	No	—	$379	Actuator included
	UST 730	Yes	Yes	—	$499	Microprocessor memory Digital readout

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sheath. If holes appear in the buried sheath, water ingresses and then 'rots' the wires inside (because it has no place to go).

2) And, the wires chosen or selected to make up the 'bundle' are high quality wires with adequate insulation. Some cost-cutting wire suppliers use low-grade wire for these bundles.

Another technique is to use individual wires and house them in 3/4 or 1 inch PVC (plastic tubing) which is buried between dish and building. The important thing here is to be sure that both ends are weather protected to insure that rain and other water does not run down into the PVC and then collect at a low spot along the PVC 'run,' causing the wires to rot. A 'rain cap' at both ends (essentially, turning the open ends to face down so water cannot 'fall in') is a good idea.

A third technique is to simply bury unprotected wires. This is not a very good choice, obviously.

One other concern relates to the amount of voltage which the dish mover actuator or controller supplies to the motor that moves the dish. Virtually nobody builds a system that requires 110 VAC anymore since running this long an 'extension cord' from house to dish is exceedingly dangerous. Most motors now operate from 24, 28 or 36 volts *DC* and this relatively 'low DC voltage' is considered safer than 110 volts AC. Still, even a 36 volt DC line is something of a safety hazard and you should make certain your installer appreciates that you don't want someone getting zapped by his wiring.

Finally, all cabled connections must be weather protected. Wherever a wire connects to a piece of equipment out-of-doors, that connection point *must* be sealed against moisture. Plastic outdoor rated electrical tape is one possibility but it is usually not the best choice since very few people know how to wrap such tape to insure that moisture cannot seep in under the tape. Moldable, pliable, sealants such as Coax-Seal™ are better choices since they easily contour to the fitting or connection, and because they do not harden or dry out, you can remove the sealant for a later service call and not ruin the connection in the process.

The Receiver

There is almost nothing which we can tell you to properly and totally prepare you for the receiver selection process. The receiver designers are intensely competitive and each trys to outdo the others in his (and surrounding) price classes to capture market share. Here are some basics:

A) Single conversion: This is a 'family' of receiver designs which dates back to mid-1980. They are inexpensive, difficult to 'break' and give good value for the money. Their primary disadvantage is that it is very difficult and quite expensive to connect two (or more) receivers to the same antenna at the same time with this family of receivers so that each receiver can have independent program/channel selection. (1)

B) Block downconversion: This is the 'modern way' to design receivers and while they still cost slightly more than single conversion, they offer you the ability to add second (etc.) receivers to the same antenna in a manner that allows each receiver to make its own program/channel selection without interfering with another receiver connected to the same antenna.

"Even a 36 volt DC line is something of a safety hazard and you should make certain your installer appreciates that you don't want someone getting zapped by his wireing."

After those two families of receivers, life gets very complicated.

Some receivers have the antenna controller built into the receiver. Some extend control of the receiver from the front panel controls to a handheld remote control. Some remote controls merely change channels and sound, while others do this plus move the dish and set the various fine adjustments required as you 'change satellites' automatically.

Some receivers have plain old monaural sound, which is perfectly adequate for virtually all of the normal satellite TV broadcasts. Many, however, offer one, two and even three different 'stereo formats.'

(1) Recently RAYdx introduced a single conversion type of receiver package which does allow two or more receivers to be connected to the same antenna without interference. The concept behind this is new and at the time of this writing the performance of this package is not field-tested.

Some receivers are plain-Jane looking while others have front panel displays that rival computer displays. Some receivers transfer to the TV screen character generated numbers and letters which tell you, on screen, what channel and satellite you are tuned to, or where your dish is pointed, or how you have your audio adjusted. Others have tiny displays that you can only read up close from the front panel proper.

Let's see what is important first.

Picture Quality: You should not lose grasp of why you are buying a TVRO. You want good quality television reception. This means pictures that are bright and clear, with accurate color tones. Here are some bench-marks 'in the sky':

1) Ask the dealer to show you the following channels, in sequence;

A) The Weather Channel on F3(R) followed by SPN on F3R. Notice the 'quality' of the video on each, especially when they are running a 'tape' on the Weather Channel (between live announcer spots).

These are your basic not-good-video examples. These are also two of the *weaker* satellite channels (anyplace) so you are testing two things here; you are looking for an absence of noise (ie. those black and white dots the dealer calls 'sparklies') and you are looking at the 'quality of the video.' A good system will have no 'sparklies' but the video quality *will be* low.

B) CBS on T302 and NBC on F1R. Again, look at the 'quality'; the video should be so good that you think you can reach out and pick a flower off the screen.

These are two of your 'best of video' choices. If the receiver seems to produce about the same quality of picture (the test is for 'sharpness' and 'detail') on these two service channels as the Weather Channel and SPN, something is 'missing' in the receiver. If you are watching a game show on either CBS or NBC (but more especially on CBS), wait until they show a screen with lots of 'bright reds' or 'bright blues' in it. If the red or blue tones wiggle and there are white and/or black lines in the solid red or blue colors, that's a sure sign of a receiver with inadequate 'definition' (they call it bandwidth in the trade). If the bright red or blue colors show up simultaneously with a modest or loud 'buzzing' sound in the audio, that's even worse.

The solution? Have the dealer show you another receiver. Or, accept that

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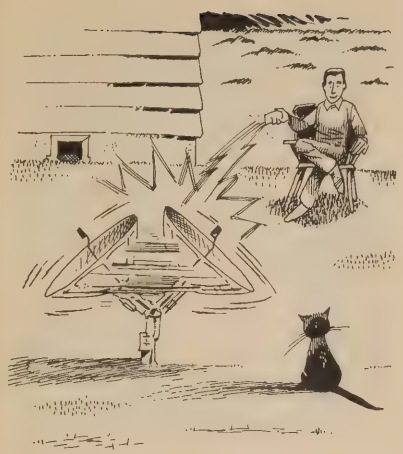
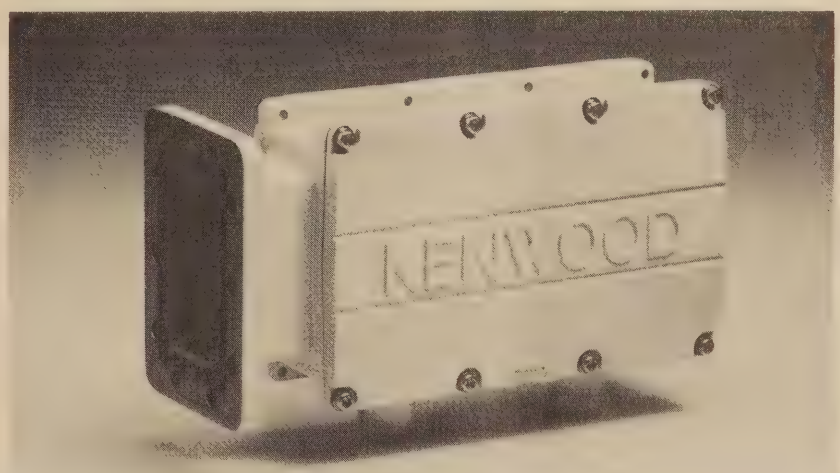


Polarotor offered by Chaparral Electronics.

LNA from Space Vision.



Kenwood's entry into the Low Noise Amplifier field.

LNA/LNB

Manufacturer	Product	Interfaces With	Noise Level	Ku Band	Price	Special Features
B.E.I. Tronics Ltd.	LNB	—	65°K-100°K	—	$289.95-$419.95	Rugged, weatherproof construction
Birdview	DLNB	—	90°K	—	—	70 dB gain nominal
Cal. Amplifier	LNA/LNB	—	60°-85°K	—	—	Lightening protection, T.I. filter, 2 yr. warranty
Chaparral	LNA/LNB	All	65°K-100°K	—	—	Combines polarotar with LNA/LNB in one product
Drake	LNA	All	75°K-90°K	—	$129.95-$169.00	50 db gain
	LNB	All	85°K-100°K	—	$199-$239	60 db Gain, Easy to install
Gardiner	Isolated LNA's 5000 series	Most	75°K-120°K	—	—	Commercial quality Slim line design
	Ultrak Non-Isolated LNA's 6000 series	Most	60°K-85°K	—	—	Commercial quality slim line design
GCI	LNA GCI 3742	—	85°K-120°K	—	—	One year guarantee built in noise rejection filter and input isolator
Hytek Amplifier	LNA Millenium 2	All	50°K-85°K	Yes	—	—
	LNB	All	65°K-100°K	Yes	—	—
Kenwood	LNB-1000	KSR-1000 Receiver	95°K	—	—	—
Luxor	LNB-9726	Luxor Block Satellite Receiver Systems	85°K-100°K	—	—	Combines LNA with Block Down converter
NorSat	LNA 4070-4095	All	70°K-95°K	—	—	Isolated - extremely low failure rate
	LNB 5075-5095	—	—	—	$298	Combined LNA and block converter allows multiple receivers from one antenna
Scientific Atlanta	LNA 9320	Scientific Atlanta HS8000, HS9000	80°K	No	$300-$400	—
Space Vision	LNA 7710-7740-7750	—	65°K-100°K	—	—	1 year warranty
	LNB 6610-6650-6660	—	65°K-100°K	—	—	1 year warranty
Uniden	LNA UST441	All	65°K-85°K	Yes	$169	Average 40 dB gain
Uniden	LNB UST900-UST911	Uniden 5000 and 7000 (plus others)	75°K	—	$288	60 dB gain
Winegard	LNA SC 8101	—	100°K	—	—	50 dB Gain
	LNA SC8185	—	85°K	—	—	50 dB Gain

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the one you are looking at (and considering) is not the best available.

Audio Quality: The many audio tuning systems available are very confusing to the typical consumer. Basically, what you want is to hear good sound and you should ask to hear it through a hi-fi system speaker package rather than the tiny 3 or 5 inch speaker stuck into the side of the TV set. The sound should not 'snap/crackle/pop,' and if you notice that is does this when there are bright colors on the screen, ask to see another receiver.

Try adjusting the sound carrier tuning *yourself;* it should tune from one sound carrier to another without a lot of whistling and irritating sounds. The best place to test this is on the signal of WGN, found on transponder 3 of Galaxy 1. This channel has as many as 20 separate audio channels on it and only one pertains to the TV picture. The rest are for various radio network feeds; and the quantity of signals on this one channel and the variety of audio formats found here is an excellent test for any receiver. If you can tune the audio controls yourself through all of these audio channels on WGN and find the sound crisp and clean on each one, you have a good receiver. Poor, noisy sound on one or two of these channels may not be a disaster since they are a real challenge to most home-style receiver systems.

Heat buildup: Place your hand on top of a receiver which has been running for 30 minutes or more. How 'warm' is it? Move your hand around over the full top of the cabinet. It will probably be hotter towards the rear than towards the front.

Heat inside of a receiver is normal. *Too much heat* is not good however since the delicate electronic circuits in the satellite receiver will 'change tuning' as the receiver heats up. This can affect the 'stability' of the receiver's tuning; it tunes fine when first turned on, but you have to retune it again and again after it has been operating for some period of time.

Any receiver which is so 'warm' that you cannot comfortably lay your hand on its case and leave it there 30 seconds, after being on 30 minutes or more, is suspicious. That much heat is going to cause you problems. Some manufacturers have a special problem by trying to power the outdoor antenna moving motor from the receiver itself. The motor uses far more 'power' than the receiver alone and prolonged use of the motor control circuits causes the receiver to heat up excessively. The solution to this is to stick the power supply for the antenna motor in a separate case, inter-connected to the receiver proper through a factory supplied length of cable. This gets the power for the whole system away from the receiver proper, and greatly reduces the heat within the receiver's critical tuning circuits. A receiver which also powers the antenna motor, but retains the powering system for the antenna motor *inside of* the receiver housing should be avoided.

Remote controls: 'Armchair control' of the satellite receiver is 'in.' But be careful. First look at each control on the receiver proper and then locate the corresponding control on the handheld remote control. Some (in fact, many) of the remote systems are only 'partially remote'; you can change a few of the receiver functions from the easy chair but not others. Obviously a remote that only does *some* of what has to be done is not much of a remote because you will still be hopping up and down from the chair to make adjustments. One of the more common 'oversights' is something called 'format selection.' If you have to push a button or a switch when changing you satellite antenna from say Galaxy to Satcom satellites, but that button is not included on the remote control, or that function is not pre-programmed into the switching procedure, you will have to get up each time you go from MTV to Disney or from CNN to Lifestyles.

"Any receiver which is so 'warm' that you cannot comfortably lay your hand on its case and leave it there 30 seconds, after it has been on for 30 minutes or more, is suspicious. That much heat is going to cause you problems."

Before you select a remote controlled system, operate the receiver fully at the receiver proper and then the remote and stand back to repeat the process. The remote should be as complete as the front panel controls required to change satellites and channels and audio tuning or it is not a full-function remote.

Rules To Guide You

A satellite TV system is a significant investment; whether you opt for one of the low-end, no-frills systems in the $1,500 region, or select a top end unit costing more than $4,000. Assuming you are selecting a system which fits your budget, you cannot afford to do it wrong.

1) **New Dealers:** Avoid new dealers. Let them 'learn' with somebody else. Remember that 70% of them will be 'gone' in six months. There is nothing more difficult to get serviced than a satellite system sold by an out-of-business dealer who bought three systems out of the back of a pick-up truck six months ago while some gypsy was crossing your state on the way to Alaska.

2) **Service Shops:** Ask to see and speak with the dealer's serviceman. He should have some semblance of a service shop, and you should ask him if he has enrolled for the SPACE 'Dealer Certification Course'—an educational program attempting to upgrade dealer technical personnel. No service shop, no tools, no work bench are all suspicious.

3) **New Equipment:** There are new pieces of equipment every week in TVRO. The failure rate of new firms offering new receivers, motors, antennas and so on is almost as high as new dealers. Stick with brand names that you can verify have been in business a minimum of a year and avoid brand new models even from established firms since virtually all new models need 3 to 6 months to get the 'bugs out.'

4) **Warranty:** Ask to see and read the manufacturer warranty statement for every significant part of your system. That includes the antenna, the motorizing system, the receiver and the LNA/LNB if your receiver does not come with these in a package. Anything less than a year (5 years on antennas) is to be avoided; no warranty at all, *in writing*, on the antenna system is a definite red flag! Verify the actual sequence for broken equipment—*where* does it go to get fixed, *will* the dealer provide you with a 'loaner' unit while the repair is being made, *how long* should a warranty repair take?

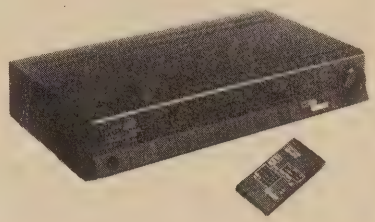
Some dealers now offer three and five year extended warranty plans. Ask about this and read the fine print carefully. This 'insurance' should cost you between $300 and $500 for five years of coverage, and remember, if you have to replace the motorization system on the antenna, that alone could set you back $500.

Continued on page 72

Houston Tracker Receiver and Locator

PenTec Receiver and Positioner

SATSTAR Receiver and Remote



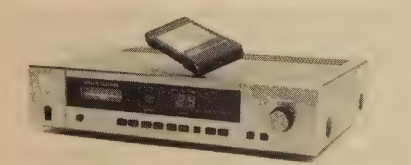
Gensat Receiver and Remote

Western's Maxum RC-011S Receiver

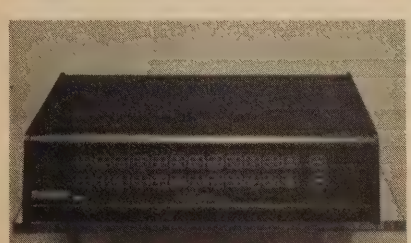
Kenwood KSR-1000 Stereo Receiver

Uniden UST 7000 Tuner

Anderson Scientific ST2010 Receiver



DX DSB-700A Remote-Control



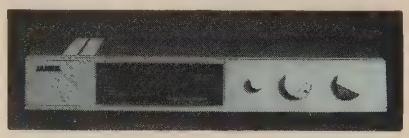
RAYDX RX1 Satellite Receiver

RECEIVERS

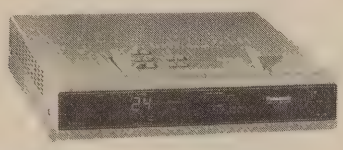
Manufacturer	Model	Remote	Tuning	Block Down Capacity	Price	Special Features
Amplica	CSR 200 CSR 1000	Yes	Pushbutton, AFC	Yes	—	C-Band, Mono
Anderson Scientific	SBR1400	Yes	Digital P.L.L.	Yes	$515.95	Channel Scan Mode 3 Channel Memory LNA Power Built In
Aruntz	Q429 Invader	Yes	Pushbutton, AFC	Yes	$695	C-Band, Mono Auto Polarization
Avcom	COM-2A	Yes	Variable	No	$555	C-Band, Mono
Avcom	COM-3R	Yes	Variable	No	$1795	Auto Polarization C-Band, Mono
B.E.L. Tronics Limited	SBR1400	Yes	Digital P.L.L.	Yes	$515.95	Channel Scan Mode. 3 Channel Memory. LNA Power Built-in
Birdview	20/20 M	Yes	Quartz Digital Synthesized	Yes	$595	Discrete/Matrix Stereo
Boman	SR 1200	No	Variable	No	—	Auto Polarization C-Band, Mono
Boman	SR 2500	Yes	Push Button	No	—	C-Band, Stereo Dish Controls Auto Polarization
Chaparral	Sierra	Yes	Computer Synthesized	Yes	—	Ku Compatible Descrambler Compatible
Channel Master	6136 6144	Yes	Digital	Yes	$959	Stereo, Parental Control Antenna Control Built-In C/ Ku Band
Channel Master	6138 6129	No	Manual	No	—	—
Conifer	XT 2000	Yes	Quartz Lock	Yes	$800-900	Stereo
Conifer	RC 2001	Yes	Continuous	No	$500-600	Built-In Positioner
Curtis-Mathes	KSR 330	Yes	Push Button AFC	No	—	C-Band, Stereo Dish Controls
Drake	SBRA5	Yes	Quartz Synthesized	Yes	—	Discrete and Matrix Stereo
Drake	ESR 324/424	No/Yes	Detent Digital Tuning	Yes	$379/499	Digital Readout Microprocessor Controlled
Drake	ESR 2240	No	Fully Synthesized	Yes	—	
DX	500	Yes	Detent	Yes	$383	Ku Compatible Decoder Ready
	600A	Yes	Detent	Yes	$363	
	700	Yes	Detent	Yes	$539	
Electrohome	E-1	Yes	Computer	Yes	$1054	Parental Lock Programmable Dish Positioner
GCI	8300	No	Variable	No	$299	Descrambler Ready
	8800	No	Variable	Yes	$459	Descrambler Ready
	200 IR	Yes	Quartz	Yes	$1279	LED Display 24 Frequency Synthesized Channels
Gensat	CDR 4/12	Yes	DFF Synthesized	Yes		Stereo, parental lock
Geo-Tech	200 IR	Yes	Pushbutton	Yes		C Band Stereo
Geo-Tech	9600	Yes	Pushbutton	No	—	C Band, Mono
Houston Tracker	System V Plus	Yes	Pushbutton	Yes	$1100	Dishcontrols Stereo. Mates with System V Positioner
Hytek/ Dexcel	SRX 500	Yes	Pushbutton	Yes	—	Dish controls, stereo
ICM Video	SR-4000P	Optional	Vemeir	Yes	$660	Professional Grade
Janiel	BCR 2000	No	Quartz Synthesized	Yes	$325	T.I. Filtering
Janiel	BCR 5000	No	Quartz Synthesized	Yes	$450	T.I. Filtering
Kenwood	KSR-1000	Yes	Digital Voltage	Yes	$1170	Parental Lockout Videoscan Switch
KLM	Sky Eye 10	No	Variable	Yes	$349	C Band, Mono
	SBR 6100	Yes	Synthesized	Yes	—	Stereoprocessor Positioner Included

ProStar XR-1 Satellite System

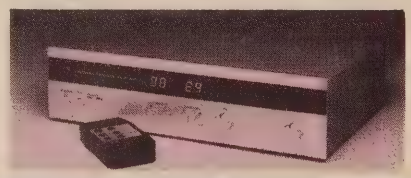
Chaparral Sierra Receiver and Remote



Janeil BCR 2000 Receiver



Panasonic C-2000 Receiver



Winegard RF-1000 Receiver

RECEIVERS

Manufacturer	Model	Remote	Tuning	Block Down Capacity	Price	Special Features
Koro	KR 3000	Yes	Detent	Yes	$499.94	Parental Lockout
Lowrance Electronics	70SB	Yes	Variable	Yes	$625	Stereo C/Ku Band
	70X	Yes	Variable	No	$460	C Band, Mono
LSI	DL 125	No	Detent	Yes	—	Synthesized Stereo 2 Year Warranty
	DL 145	Yes	Computer Synthesized	Yes	—	Matrix and discreet stereo. 2 Year warranty
Luxor	9995	No	Detent	Yes	$349	Descrambler connection
	9990	Yes	Frequency Synthesized	Yes	$899	Ku Compatible. Parental lock
	9550	Yes	Frequency Synthesized	No	$1099	Wide/Narrow Audio
M/A-Com	T1	Yes	Pushbutton	Yes	$767	Stereo C/Ku Band
	2000R	Yes	Pushbutton	Yes	$935	C/Ku band. Stereo
NorSat	JR-100	No	Quartz Synthesized	Yes	$853	Decoder Compatible
	JR-200	Yes	Quartz Synthesized	Yes	$1040	Decoder Compatible
	NRF-300	Yes	Quartz Synthesized	Yes	$1201	Stereo, remote Satellite selection
	JR-300	Yes	Quartz Synthesized	Yes	$1303	Ku Compatible Decoder Compatible
Panasonic	C2000	Yes	Computer Synthesized	Yes	—	Compatible with Linkabit Descrambler
	KV/C-6000	No	Pushbutton	Yes	—	Ku Band reception
Pentec	Alpha	Yes	Frequency Synthesized	Yes	$1050	2 yr guarantee stereo sound positioner included
	Comp	Yes	Quartz crystal Variable lock	Yes	$1295	Parental lock out matrix, discreet stereo positioner and LNB included
Pico	HR 1000	Yes	Quartz Synthesized	Yes	—	Decoder compatibility 3 audio modes
	SR 4590	No	Continuous	Yes	—	—
ProSat	31570 MHZ	Yes	Continuous Channel	Optional	—	VHF remote; Positioner included
Prostar	XR-1	Yes	Quartz lock Step Tuning	Yes	$599	Full matrix stereo. Designed for multiple TV installations
Raydx	Rx-1	Optional	Quartz lock Synthesized	*No	—	Parental lock out *Additional receivers can be added
Royal/Sat	BR-200	No	Detent	Yes	—	Capable of Ku Band
	BR-300	Yes	Computer Synthesized	Yes	—	Built in positioner C/Ku band capable
Sat Star	Elan	Yes	Synthesized	Yes	$449	Channel scan
Scientific Atlanta	HS800	Yes	Synthesized	Yes	$700-$800	Discreet or Matrix stereo. Descrambler ready Includes antenna control
Space Vision	8800	—	Detent	Yes	$374	Clamped or unclamped output for integrating with descramblers
STS	LSR	Yes	Frequency Synthesized	Yes	—	Combines receiver with actuator controller
	SR-Block	Yes	Microprocessor Controlled	Yes	—	Stereo capability
Teki	TR330	Yes	Pushbutton	No	$379	Dish controls stereo
Transat	2M7	No	Step Tuning	Yes	$399-$479	Descrambler ready optional stereo
Uniden	UST2000	No	Digital Touch	No	$279	Microprocessor controlled
Uniden	UST 5000 6000, 7000	Yes	PLL Quartz Synthesized	Yes	$379-$1099	Stereo LED readout
Viewstar	USS 1450	Yes	PLL Synthesized	Yes	$695	Stereo Ku Adaptable
Wilson	YM 450	No	Continuous	Yes	—	C Band, mono
	YM 1000	Yes	Continuous	No	—	C Band, mono
Western	Maxum	Yes - on certain models	Continuous or push button	Yes		Stereo, remote has full access for actuator tuning
Winegard	RF 0600	No	Variable	No	$750	C Band, mono

"Selecting satellite equipment for the 'first-timer' can be very confusing . . . Do not (repeat: DO NOT) shop just on price!"

Continued from page 71

5) **Guaranteed Service:** What you 'see' in the dealer's showroom may not be what you can expect in your own home. The problem is something called 'look angle' and 'TI'; terrestrial interference. Both are beyond the scope of this equipment overview but you should simply ask the dealer to 'guarantee' that you will have no interference and no 'signal blockage' of your 'look angle' before you sign anything.

A quality dealer will not hesitate on either count and he may even offer to come to your house to perform a 'signal survey' before he has you sign anything. This is a procedure where he measures to be sure no trees, hills or buildings 'block' your sky-view towards the satellites, and, a test to ascertain whether unwanted microwave signals from telephone company microwave (etc.) transmitters might interfere with your reception. There are solutions to both problems, usually, but they tend to increase your cost of the system and better you know about these costs upfront than after they have poured two yards of concrete and dug up your lawn to bury cable.

Selecting satellite equipment for the 'first-timer' can be a very confusing, and dangerous activity. Do not (repeat: *do not*!) shop just on price. Even the very same equipment with a 10% price differential should not send you automatically to the cheapest guy offering you a system. Sooner or later your satellite system will break (hey, so does your car and your refrigerator; would you buy either of these items from some guy going through town with a large flatbed truck?). And there is more than ample opportunity for a dealer to cut corners on the system he sells you even though he may have represented to you that it is *identical* to the one up the street costing $300 more.

A home TVRO system is a major investment; buy it carefully.

Continued from page 63

stronger, a minimum amount of noise is contributed to the signals. An ideal unit would amplify the signal and eliminate (cancel) all of the noise. There is no such ideal unit so some amount of noise must be accepted. LNA/LNB devices are graded based upon the amount of noise they contribute to the signal(s) with less noise being more desireable. The noise is measured on a test set which establishes the noise contribution in 'degrees Kelvin' or K. A 65 degree LNA/B is a better unit than an 85 degree unit because there is approximately 24% less noise in the 65 degree unit. LNA/B units vary in noise quality and their cost is a function of how good they are. Manufacturers would ideally produce 100% of their units as 65 degree (or lower) devices but in practice they get a small percentage of 65 degree units, a larger percentage of 75 degree units, a still larger percentage of 85 degree units and so on. Those that work best, and have the lowest noise temperature, are also in shortest supply or 'yield' and therefore cost most.

Downconversion: The super high frequency (SHF) microwave band signals which satellites use to transmit to earth are not capable of being carried for long distances inside of cable. Even very short lengths of standard coaxial cable will attenuate (reduce in strength) these SHF signals very quickly; to about 1/2 power in approximately 5 feet of common coaxial cable. To overcome this 'cable loss factor,' TVRO systems translate or convert these SHF band signals to a lower frequency band (called an 'IF' or intermediate frequency) so that cable runs to several hundred feet can be used between the dish antenna and amplifier, and the receiver proper, usually located inside of a home. The unit that does this 'frequency conversion' or translation is called a *downconverter; 'down' because the SHF band of signals is converted 'down' to a lower* frequency band.

The downconverter may be in a box all to itself, mounted behind the dish in a weatherproof container, or, it may be in the same container as the LNA, mounted at the feed or the antenna (called an LNB).

Motor Drive: The antenna is designed to track through the sky, following an imaginary arc or belt in the sky some 22,300 miles above the equator; kind of an elevated 'equator ring' or 'shadow.' It is along this belt, at regular intervals of several thousand miles, that the geo-stationary (ie. Clarke Orbit, 'stationary') satellites are parked. The dish is moved from satellite to satellite, along this imaginary belt or highway, with a motorization system which is controlled from indoors (the actuator or controller).

Dish Mount: The antenna must be suspended in a stable, stationery position above the ground and installed on a rotating arm which allows the motor drive to sweep the dish left and right (east and west) along the Clarke Orbit belt. The mount is a rigid, strong support for the dish proper, plus it also serves as a mechanism that allows the dish to pivot around a central arm or point to trace an arc through the sky that approximates the location in the sky where the 'Clarke Orbit Belt' is located.

Dish Cabling: Interconnection between the outdoor antenna (feed and LNA/LNB), the motor drive, and, the indoor receiver and dish controller system is done with a set of cables. Each cable or wire size is selected by the function to be fulfilled. Signals from the downconverter to the receiver must be transported in a protected, 'shielded' environment. Coaxial cable, with a circumference of 'shielding wire' around the center signal-carrying wire is for this purpose. The motor drive uses a relatively low (DC) voltage but consumes several amps of power. Thus, this wiring must be heavy duty to carry the heavy flow of current and excessively long runs will reduce the voltage available because of 'voltage drop' along the wire length. Dish sensor controls, which tell the indoor dish mover where the dish is pointed and when and where it has stopped, carry no voltage or a very low voltage and are typically small diameter cables with or without a protective 'shield' to insure that local interference does not leak into these wires and cause false 'sensor indications' at the dish controller.

Receiver/Demodulator: The downconverted signals travel indoors from the dish on coaxial cable to be processed inside of the receiver. When transmitted from the satellite, the video and audio signals are mixed together and the receiver must separate the two signal 'bits' and then after separation individually process these signals. On the back of (most) receivers there are 'video' and 'audio' output jacks which can be connected to TV 'monitors' (not receivers) for viewing and listening. Since most people do not own 'monitors,' there is also an 'RF' or 'modulated' output connector on the back of the receiver which is connected directly (or through a switch) to the standard TV receiver antenna connection post. In this case, the TV receiver accepts the satellite TV programming just as it would accept any regular TV or VCR signal because the original super high frequency (SHF) satellite broadcast has been reduced in frequency to a new frequency which is compatible with the TV set tuning system, *and* the satellite broadcast has also been 'converted' from the special 'FM' (frequency modulation) transmission format to a standard 'NTSC' (American standards) TV signal.

Audio Tuning: Because the audio signal(s) is mixed with the video during the satellite transmission phase, it is possible to send more than one audio signal with one TV picture and not have interference. Many satellite services carry several additional audio (or data/text) channels of information unrelated in program content to the TV picture. To tune-in these 'auxiliary' signals on a satellite channel, the TVRO receiver has a special audio tuner built in. For reception in stereo, *two* identical audio tuners are built into the TVRO receiver and one is used for the 'left channel' while the second is used for the 'right channel.' Connections on the rear of the satellite receiver allow the user to select mono (single channel) audio, stereo audio, a variation of stereo audio, and connect that sound to an external sound (hi-fi) system.

Remote Control: All of the functions of a satellite receiver system can be removed from the receiver proper and placed inside of a handheld 'remote control.' The remote control duplicates some or all of the receiver's operational functions thereby allowing the viewer to 'direct' the system from channel or satellite to satellite from a distance. Remote controls are either wire-connected (ie. piece of wire between the satellite receiver and the remote unit), infrared (using an infrared light beam to transmit the commands from remote to receiver) or 'UHF wireless' (using an ultra-high frequency radio signal to transmit the commands). Wire-control remotes require direct wire connections between the two units; infrared remotes must have 'line of sight' contact between the handheld unit and the TVRO receiver (sensor) unit. UHF wireless units can command the receiver and dish through walls, floors and other objects over a range of several hundred feet (typically). Some infrared units can be 'extended' to additional rooms with a combination of infrared and wire-interconneted 'substations' between rooms.

THE RIGHT QUESTIONS

What You Should Ask Your Dealer

Picture this. You've just parted with several thousand dollars for a top of the line TVRO system. You've got the dish, the receiver: all the newest gadgets. The big day comes; you're ready to have your baby installed. You flip on the set, anxiously waiting to see Galaxy One's signal appear, and low and behold, you've got—Sparklies! The installer then informs you that, unfortunately, you've got "Terrestrial Interference" and it's going to cost you up to $2,000 for filtering equipment.

This is just one example of what can happen if you don't ask the right questions *before* you buy your TVRO system. A little research before your purchase can save you hundreds (maybe even thousands) of dollars. By giving you a few basic questions to help you select a dealer and then the right equipment, this article will help you make a knowledgeable purchase. (Most people think that the type of equipment selected is the most important consideration, when actually, choosing a reliable dealer may be the most critical issue. The first five questions here pertain to finding the right dealer for you.)

WHAT TO ASK A DEALER

1) Will you visit my home and do a site survey before installing the system?

It is imperative that your dealer check for interference and reception before the actual installation. Microwave interference can come from nearby telephone relay equipment or airport radar, and the result on your set can range from mild to total obstruction of your picture. The cost for filtering out the interference can be prohibitive, so be sure that if, for some unknown reason, your dealer does not check for interference, he gives you a written guarantee that your system will not suffer from this problem. Also, make sure that he checks for reception interference of another sort; obstructions. The key is finding a dealer who knows what to do in case of such circumstances such as a tall tree or mountain, or a too small yard. A tall pole mount would be the solution, and it's important that your dealer has experience installing that type of equipment.

2) How will the service and warranty be handled, and what about installation insurance?

First of all, you want to make sure your dealer is insured against property damages incurred during installation. Next, there should be at least a one year warranty on the installation itself. It might be a good idea to not pay the dealer the entire cost of the system until after the installation; thereby creating your own insurance. Finally, be sure to get a specific outline of the dealer's policy on services, where the repairs will be done, and what you'll have to pay for.

3) What satellites will I be able to receive?

Ths is one detail you should get in writing. By promising you specific satellite reception, your dealer is obligated to perform a site survey before the installation to ensure that there will not be any outside interference or obstructions. Also, it insures such things as trees currently without leaves will not block reception when the leaves return. Finally, it insures that the dish mover and the dish mount will be properly set to track all the satellites that you want to receive.

4) How will the wiring be run, and how will the system be weatherproofed?

Some dealers also run buried cable in conduit which will protect it from animals and gardners. All loose cable at the dish should be strapped down with cable straps. The cable entry point into the house should be properly caulked and sealed. In the house, all cable should run through the attic or walls, or even under the house.

Besides being covered with PVC or metal conduit, all connections should be sealed with a sealant such as Coax-Seal. Many silicon sealants contain solvents that can corrode the connection. Just covering the connection is not enough because moisture in the form of vapor can collect into covered connections during periods of high humidity, and then condense back into liquid when the temperature falls.

5) What will be included in the price of my installation?

It's important to know just what you're getting for your money, and what you may or may not have to pay for in the future. Will your dealer connect your video cassette recorder into the system? (Usually done for free.) What about hooking up extra TVs in the house? (Usually $40-$50 extra) Will a wall box and cover plate be installed wherever cable enters a room? Will he hook the audio output of my receiver into my stereo so that I can hear satellite TV sound through my stereo system? (Usually $10-$20) It's best to get all these specifics first before the actual installation.

SELECTING THE RIGHT EQUIPMENT

6) What model and size dish should I buy?

No one type of dish construction is best. You may hear that one type is better than another, but there are good and bad versions of every basic dish design.

Performance, reliability, and appearance are the most important factors to keep in mind when selecting a dish. Other than appearance, it is very difficult to evaluate the merits of a dish just by looking at it. This is why it's so important to know and trust your dealer before making your selections.

A satellite receiving dish is formed in a very specific and critical shape called a parabola, and it must hold this shape to continue performing well. Dishes that are poorly designed or constructed can have a distorted surface shape or become distorted later resulting in a poor picture. Be particularly careful of low cost, no-name sectional fiberglass dishes. Some are produced by people who do not have the expertise to properly manufacture a fiberglass dish and many of these are warped and will warp later.

As far as dish size is concerned, the proper selection is dependent upon a number of factors. The closer you are to the center of the U.S., the smaller the dish you will need to get a clear picture. Satellite TV signals are a beam that is usually aimed at the center of the U.S. and is strongest at the center while growing weaker toward the edge. As a result of this, a large dish is needed in the areas at the edge of the beam to collect the same amount of signal collected by a smaller dish at the center of the beam.

The strength of transmitted signals vary from satellite to satellite and may become weaker as the satellite ages. If you are only concerned about watching one or two of the stronger satellites, a 4- to 6-foot dish may do. If you want a good quality picture from most of the satellites with some margin built in for satellite aging then a larger dish will be needed. Only you can determine what your viewing needs are, and it's best to compare picture quality of different satellites on different size dishes before you decide what is best for you.

7) What kind of receiver should I buy?

Different receivers come with different features, and obviously, the more features, the higher the price. It's really up to you to determine just what you can't live without. Channel selection is the most frequently used function of a receiver, and there are two different types, continuous and detent. Continuous tuning is similar to a radio tuner in that the tuning knob gives only an approximate indication of where the channel is located. Detent tuning uses either a knob or buttons with a specific stop or click which indicates the exact location of the channel.

Also, an important feature is the type of hand-held remote control. You can choose from infrared or radio. The infrared remotes can only be usd in the same room as the equipment. A radio remote can be used throughout and even outside the house.

Another consideration is stereo sound. As mentioned previously, your dealer can hook up the output of your receiver's audio to your stereo system (if you buy a receiver with such capability) for truly outstanding sound. Be sure to consider if you want to add additional receivers later. You may want to take a look at block down conversion receivers that have the capability of having "all the channels" in different rooms of the house. (See *HOME SATELLITE TV,* September issue.)

8) What type of picture quality can I expect?

As it is with any type of TV viewing system, picture quality varies greatly. It is best to compare the picture from different equipment on the same TV set, because a poor quality receiver connected to a good TV set may look better than a better quality receiver connected to an inferior TV. Make sure you check on the reception received from weaker satellites such as Satcom F3 and Comstar D4 rather than just the stronger signals from Galaxy 1.

9) What kind of dish mover should I buy?

Again, the quality in dish movers varies with the price. You can choose from simple models that move the dish by pushing a button, or more advanced models that store the position of the satellites in their computerized memory and move to the selected satellite upon command.

Some dish movers use a cylindrical arm that is attached to the dish to move it back and forth. Another type uses a chain drive approach which allows the dish a full 180 degree range of movement from one horizon to another. It is very important to purchase a dish mover with the feature that protects it from moving the dish too far in either direction. Without this feature, it is possible to damage the motorized arm or even literally run the dish into the ground.

10) What type of warranty does my system have?

Most equipment carries a one year parts and labor warranty. Make sure your dealer gives you the exact specifics of your particular warranty. Some include the costs of the dealer visiting your home to analyze problems, and even taking parts back to his shop for repairs.

Taking a little extra time and research before you buy a TVRO system will pay off in time and money in the long run. Finding an experienced dealer is the best investment you can make. Selecting reliable, name brand equipment along with the advice of your dealer will bring you many years of exciting and entertaining television.

TUNE IN 130 CHANNELS

Here Are Your Current Choices ...And They're Growing

● AURORA
(143 West)

20 Alaska Television Network
Educational

24 Alaska Satellite Television Project
Various Network Programming

● SATCOM 1R
(139 West)

8 NBC Network
Central Time Zone

11 WTN
Worldwide News

20 Armed Forces Satellite Network
Various Network Programming

24 Radiotelevisione Italiana
Italian Network News

● GALAXY I
(134 West)

2 Nashville Network
Country Music & Entertainment

3 WGN-TV
Chicago Superstation

4 The Disney Channel
Family Entertainment

5 Showtime (East)
First-run Movies

6 SIN
Spanish Network

7 CNN
Cable News Network

8 CNN Headline News
Newsbrief Service

9 ESPN
24-hour Sports

10 The Movie Channel (East)
First-run Movies

11 CBN Cable Network
Religious/family

12 Home Team Sports
Northeastern Sports

13 C-SPAN
House of Representatives

14 The Movie Channel (West)
First-run Movies

15 WOR-TV
Secaucus, NJ Independent

17 PTL
The Inspirational Network

18 WTBS
Turner Superstation

19 HBO/Cinemax (East)
First-run Movies

20 Galavision
Spanish Entertainment

22 Discovery Network
Science/nature Documentaries

23 HBO (East)
First Run Movies

24 The Disney Channel (West)
Family Entertainment

● SATCOM 3R
(131 West)

1 Nickelodeon
Children's Programming

2 PTL
Religious Programming

3 TBN
Religious

4 FNN
Financial/business News

6 SPN
Variety

8 CBN Cable Network
Religious/family

9 USA Network
Sports/variety

10 Showtime (West)
First Run Movies

11 MTV
Music Videos

13 HBO (West)
First Run Movies

14 CNN
Regional News

15 VH-1
Music Videos

16 ACSN - The Learning Channel
Educational

HTN Plus
First Run Movies

17 Lifetime
Health/personal Improvement

18 Reuter's Monitor Service
Stock Market Info

EWTN
Religious

NJT
Jewish Television

19 C-Span
House of Representatives

20 BET
Black-oriented Entertainment

21 The Weather Channel
National and Regional Weather

22 MSN-The Information Channel
General Information/entertainment

23 HBO Cinemax (West)
First Run Movies

24 Arts & Entertainment
Performing/cultural Arts

● COMSTAR 4
(127 West)

13 Selec-TV
First Run Movies

18 CMTV
Video Country Music

20 **American Extasy**
Adult Programming

22 **KTVT**
Texas Superstation

● WESTAR 5
(123 West)

1 **NYRA**
New York Racing

2 **The University Network**
Religious

5 **JISO**
Japanese News

8 **PASS**
Michigan Sports

14 **PASS**
Michigan Sports

15 **PENN**
Horse Racing

22 **Taft Broadcasting**
Sports/news

The Meadows Racing Network
Nightly Harness Racing

24 **Taft Broadcasting**
Sports/news

The Fantasy Channel
Adult Entertainment

● SPACENET 1
(120 West)

15 **ACTS**
Religious

21 **BTN**
Baptist Instructional

16 **SIN**
Spanish Network

● ANIK C3
(117.5 West) Ku

Knowledge Network

Superchannel/First Choice

Atlantic Satellite Network

Superchannel/First Choice

● ANIK D
(104.5 West)

2 **TSN**
24 Hour Sports

6 **Much Music**
Music Video

8 **CHCH-TV**
Ontario Independent

9 **WDIV-TV**
NBC-Detroit

10 **WXYZ-TV**
ABC Detoroit

11 **CBC (Pacific)**
French Language Programming

14 **TCTV**
French Network

15 **CBC (East)**
French Language Programming

16 **CBC Parliamentary Network**
Canadian House of Commons

18 **CITV-TV**
Alberta Independent

19 **CBC (Atlantic)**
French Language Programming

20 **CBMT**
CBC English Network

21 **WTVS-TV**
Detroit PBS

22 **CHAN/BCTV**
British Columbia Network

23 **WJBK**
CBS Detroit

24 **CBC Parliamentary Network**
Canadian House of Commons

● WESTAR 4
(99 West)

6 **WOLD Communications**
Occasional Sports/news

Word of Faith Satellite Network
Religious

Meadowlands Horse Racing
Horse Racing

10 **Word of Faith Satellite Network**
Religious

11 **WOLD Communications**
Occasional Sports/news

CTNA
Catholic Television

15 **PBS**
Public Broadcasting

16 **CNN**
Regional News

17 **PBS**
Public Broadcasting

23 **PBS**
Public Broadcasting

Bonneville Telecommunications

● TELESTAR 301
(96 West)

2 **CBS**
CBS Central time

3 **ABC**
Regional news

4 **ABC**
LA/NY programming

6 **ABC**
Occasional newse

7 **CBS**
CBS Central time

10 **ABC**
ABC Central time

13 **Hughes Television Network Sports**

Major League Baseball Network
Baseball highlights

Independent Network News

● SBS 3
(95 West) Ku

3 **NBC**
NBC Pacific

5 **NBC**
NBC Central time

7 **CONUS/Hubcom**
Newsfeed

9 **NBC**
News

10 **U.S. Army School of the Air**

● WESTAR 33
(91 West)

5 **CNN**
Regional news

● TELSTAR 302
(86 West)

10 **ABC**
ABC Pacific Time

11 **ABC**
Occasional news/sports

15 **CBS**
LA/NY programming

16 **CBS**
CBS Pacific Time

19 **CBS**
CBS Occasional sports/news

20 **CBS**
CBS Central time

● SATCOM 4
(83 West)

1 **HBO**
First run movies

2 **BRAVO**
Performing/cultural arts

4 **Nickelodeon (West)**
Children's programming

5 **ABC**
Network remote feeds

6 **Hughes Television Network**
Sports

7 **NCN**
24 hour religious programming

9 **Sportsvision**
Chicago sports

10 **AMC**
Movie classics

11 **HSE**
Regional sports

12 **The Playboy Channel**
Adult entertainment

13 **NESN**
New England Sports

14 **HSE**
Live sports

15 **HIN**
Health & Medical information

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SATELLITES AND THE LAW

"The issue has never been payment, as the home satellite television industry has made it clear that it recognizes that fair payment (for programming) must be made. The issue is fair competition."

Continued from page 26

sure the home earth station viewer's right to access scrambled signals on a fair and responsible basis. It believes that the current "scrambling plans" of various industry members warrant legislation to protect the interest of home satellite users.

SPACE and home satellite earth station representatives have been excluded from the NCTA "scrambling" consortium. SPACE has also been excluded from the meetings held by CNN, ESPN, MTV and other basic cable services in order to develop scrambling plans. HBO's presently announced system for distributing scrambled signals to earth station viewers calls for home viewers to purchase HBO from cable operators or directly from HBO at a cost of $12.95 a month for HBO and Cinemax. SPACE and earth station dealers are excluded from participation in the distribution of the HBO signal. Because none of the scrambling plans being implemented by programmers or cable companies permits participation by representatives of the earth station industry, federal legislation is needed to protect the rights of home earth station viewers.

Earlier this year Congressman Tauzin along with Congressman Rose and Congressman Chappie introduced H. R. 1840 to ensure fair access by home station viewers to scrambled signals. Also earlier this year Congressman Gregg introduced H.R. 1769 which calls for a two-year moratorium on the scrambling of satellite signals, in order to give the programmers and users alike an opportunity to develop a workable scrambling distribution system. In response to the current developments on the scrambling front, Senator Gore introduced into the Senate S. 1618, a companion bill to H.R. 1840. The Senate bill also calls for access to scrambled signals on a fair and equitable basis by home earth station viewers. There is significant congressional interest in all of these bills and Congressmen Tauke, Tauzin and Gregg have all asked for Congressional hearings on the House bills in order to air the significant problems currently posed by scrambling.

In addition to legislation, a marketplace solution is being sought by several newly-formed "earth station friendly" companies that are not affiliated with either the programmers or the cable companies. Hopefully, other "earth station friendly" companies will develop so that there are a number of non-affiliated companies competing to distribute scrambled programming to home earth station viewers. Competition among such companies would result in a workable marketplace solution to scrambling and would serve the interests of the home earth station user.

Over the past several years, we believe it has become clear to programmers that earth station viewers are committed to paying for programming. The issue has never been payment as the home satellite television industry has made it clear that it recognizes that fair payment must be made. The issue is fair competition. Home earth station viewers want access to scrambled programming on a fair and equitable basis and have taken significant actions in order to obtain this access.

Although the scrambling issue has confused satellite earth station consumers, one thing has become increasingly clear—the skies will not go black. "Earth station friendly" program distribution companies are being organized and Congress has become more and more aware of the public benefits provided by satellite earth station technology and of the home earth station viewer's willingness to pay a fair and equitable price for scrambled programming. We believe that Congress will support the technology and make certain that we reach our goal, your help is needed. Please write to your Senators and ask them to support S. 1618. Then take a moment to write to your Congressman and ask them to support H.R. 1840 and H.R. 1769. These actions on your behalf will help to ensure that the skies do not go dark.

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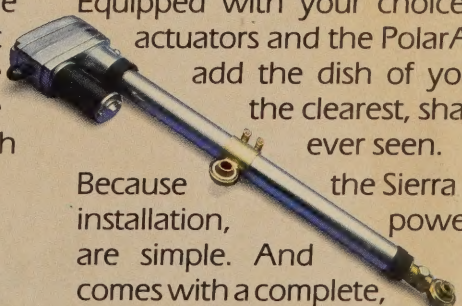

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